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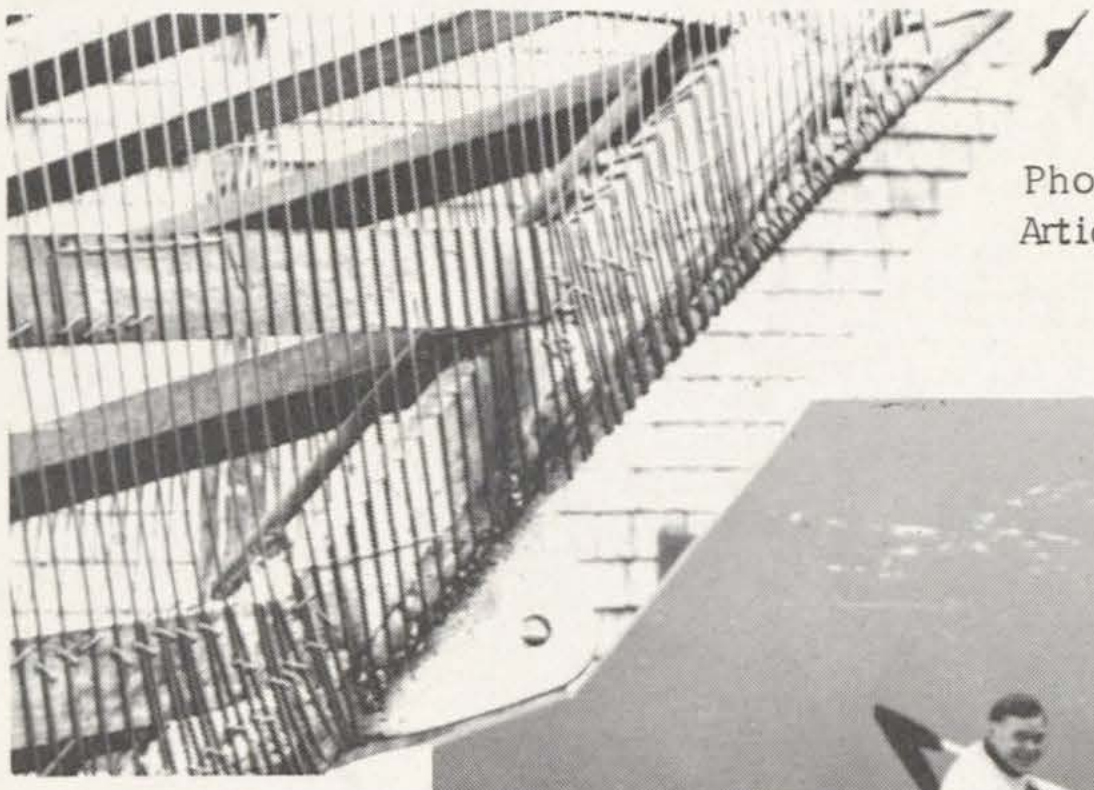
AYRS JOURNAL 83A

January, 1976

Yacht Research, Design, Science & Technology
Materials and Amateur Boatbuilding
Practical Cruising, Single-Handing, Self-steering
Sail Rigs, Spars & Rigging
Advanced Craft
Yacht Designs: New and Old Concepts
AYRS - Florida-Caribbean Contact Group



Photos from Aladdin
Article - See Pag. 24

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2. Hydrofoil Applications - Part I.
3. Drag Angles - Part I.
4. AYRS-FCCG Sailing Meetings 1, 2, and 3.
5. The Aladdin Process of Boatbuilding.
6. Cat Schooner Pirogue JULIANA.

THE AMATEUR YACHT RESEARCH SOCIETY
(Founded, June, 1955 to encourage Amateur and Individual Yacht Research.)

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AYRS 83 A AMATEUR YACHT RESEARCH SOCIETY January, 1976

The AYRS is an international, non-profit society for the amateur yachtsman, boat builder, yacht researcher, inventor, designer, sailor and experimenter. For an annual fee of $15.00, Members in North and South America receive six issues per year of our bi-monthly journal plus one book each year edited at AYRS Headquarters in England.

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Editor: John W. Shortall III, 10822 92nd Avenue North, Seminole, Florida 33542.
Publisher: Richard Kelting, 607 North Cottonwood, Richardson, Texas 75080.

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In its 20 years of existence, the AYRS has published over 6,000 pages of material on yachts in almost 100 booklets and books. A few years ago, our Founder and Editor: Dr. John Morwood, reduced his AYRS activities as it became apparent that this worldwide group had achieved permanence in the world of yachting researchers and those just curious about boats. Master Mariner Michael Ellison then took over the administrative details and much of the correspondence with Members. Additionally, he published several of the permanent AYRS books and edited eleven AYRS booklets in the "AYRS AIRS" series, in between sailing trips across the Atlantic and many of the major European sailing races.

The AYRS now begins a new phase in its publication activities. At least one AYRS major book will be produced each year in England composed of contributions from Members worldwide. The next is to be AYRS 81: SAILS 1976 by Ken May and will be sent free to AYRS Members. AYRS 82: DESIGN FOR FAST SAILING by Edmond Bruce and Harry Morss is now available for optional purchase as announced elsewhere. Production costs were too high for this major work to be offered free to Members. Michael Ellison will concentrate on AYRS administrative details and production of major AYRS works, while I will edit the bi-monthly journal of which this is the first. Michael will combine two issues of each of our journals and mail them three times each year to AYRS Members outside North and South America to continue the system of AYRS Members receiving four publications per year.

With emphasis on the third word in our title: RESEARCH, I will attempt to continue the tradition developed by our Founder: John Morwood of printing in the symposium or debate format. I welcome criticisms, letters, written contributions and NEW MEMBERS. One problem will be to assure ideas and written contributions from Europe, Australia, New Zealand, Canada, South Africa, and South America where particularly large numbers of AYRS Members are located. I will rely heavily on Michael Ellison to assure that a continuing flow of ideas and materials will come to me from those areas and most particularly from England which seems to me to have the highest concentration of amateur yacht experimenters and idea producers of any country. Very fortunately, John Morwood has promised his help, and I will be printing some of his many ideas.

Major attention will be given to the following areas: the science and technology of yachts, yacht research and experiments, new ideas concepts and innovations, amateur boatbuilding and a project dear to my heart - The Poor Man's Yacht, practical cruising including short- and single-handed sailing and self-steering, sail rigs, spars and rigging, advanced craft including multihulls and sailing hydrofoils, and yacht designs with both new and old concepts.

The AYRS welcomes professionals as well as amateurs as Members. However, what the professionals often do not like is that we will continue to publish far-out

ideas, speculations and at times impractical suggestions. We are in no way competitive with existing yachting magazines nor do we wish to be. Some have been particularly helpful lately in publicizing our efforts to increase membership: BOATING, CRUISING WORLD, MULTIHULLS, SEA and YACHTING.

About six months ago we began a sub-group of the AYRS which we call the: AYRS Florida-Caribbean Contact Group - AYRS-FCCG. With almost 100 members, we have been issuing our own AYRS-FCCG Newsletter but now will combine that with this new publication. We have held one sailing meeting, and two more are scheduled as detailed elsewhere in this letter. FCCG Members range from Virginia to Florida to Texas and throughout the Caribbean, although we have many from other areas who have a sailing interest in this area.

I maintain a stock of AYRS in-print publications in this country for sale to new and old AYRS Members who receive a substantial discount on paperback versions of the larger bound books.

The AYRS Committee has approved our request that up to a maximum of two years, henceforth the subscription fee for AYRS Members in The Americas will be reduced to $10 per year for bona-fide university or college students attending recognized institutions of higher learning. We cannot really afford this, but we do want to encourage the next generation of yacht persons to become interested in yacht research and design, and we welcome their contributions. This reduced rate does not apply to libraries. Similarly, the Committee approved a reduction in subscription fees for those who have been AYRS Members for ten or more continuous years and who are 65 years of age or older.

Due to his kind efforts in spreading the word on the AYRS, it was decided to grant honorary AYRS Membership to Charles Chiodi, Editor of MULTIHULLS MAGAZINE, 91 Newbury Ave.; No. Quincy, MASS 02171. Charles writes me that MULTIHULLS Magazine with the cooperation of Canadian Multihull Services will hold the first World Multihull Symposium at the Harbour Castle in Toronto, Canada, June 14-17, 1976. Designers who have accepted to be on the panel are: Newick, Crowther, Wharram, Brown, Cross, Myers, Simpson, Harris and Horstman. Also invited are: Macalpine-Downie, Kelsall and Allegre. D. H. Clarke will be the moderator.

The AYRS badly needs new members, and I do ask your help in securing same. The more members we have, the more we can print - it is just that simple. We want to try to cover the entire fields of yacht science and technology, amateur boat building and special aspects of yacht design and yacht cruising as you will see. Please let me have articles, sketches, photographs - black and white preferred - and most of all your criticisms, suggestions and rebuttals to what is printed. I like disputations and well-reasoned controversies and so do many others. Precious little about yachts is other than matters of opinion.

Happy Sailing, Jack Shortall

NEW AYRS BOOK ON YACHT RESEARCH

AYRS 82 - DESIGN FOR FAST SAILING - RESEARCH AFLOAT AND ASHORE

By: Edmond Bruce and Harry Morss. Edited by: John Morwood.

First Edition - 1976 - Amateur Yacht Research Society

320 pages; 151 illustrations; $22.00 hard cover postpaid.

The Members of the AYRS should be proud and thankful to Edmond, Harry, John and Michael Ellison for the production of this major work. This is the crowning achievement of some of the best AYRS papers to advance our understanding of how and why sailing yachts perform as they do, how to measure performance, test models, build experimental equipment, and perhaps of most importance many clues are given for the improvement of existing craft as well as for the design of the sailboat of the future. It is a major addition to the meager literature on this subject, and is written in clear and understandable English. The only prerequisite know-

ledge required is a bit of high school mathematics and a curiousity about what makes boats sail. It is immensely practical with much advice given for making easy and inexpensive tests of existing boats and sails and elementary mathematical analyses of their performance.

AYRS 82 is provocative, imaginative and represents a giant step forward in our understanding of the manifold problems encountered by a yacht trying to overcome the resistance of air and water. Studying this volume makes me want to rush out to my boat shop and get busy building models, test equipment, a wind tunnel and a test tank. I hope it has that effect on many others.

There are reprints of some of the more significant early work of Edmond Bruce and Harry Morss plus much that has never before been published including some of Edmond's last work before his passing. John Morwood's chapter: "Quest for the Ultimate Yacht," is brilliant and insightful as usual. Treatment is evenly balanced between single and multi-hull craft as well as five chapters on: Hydrofoils for Anti-Heeling, Lift, and Steering.

It is our hope that this book will stimulate many to begin to experiment in one or more of the many facets of yacht behavior, and to publish their results. Clearly, it is up to the amateur yacht experimenter, researcher and inventor to advance our understanding. The secrecy, bureaucracy and stifling racing rating rules have had the opposite effect for many years in this country at least.

AYRS 82 does not pretend to be complete - it just helps us take one more step along the road of understanding how Nature will let us best accommodate our frail hulls and sails in the best ways possible to wind and waves. We badly need more experimental information and look forward to new editions of this fundamental work.

AYRS 82 will not be sent to AYRS Members as their "book of the year," - it is for optional purchase only. The price is $11.00 to AYRS Members only in the hard cover version including postage and $ 22.00 for non-members. I have a limited supply of paperback copies for sale to AYRS Members only at $6.50 including postage.

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YACHT RESEARCH, DESIGN, SCIENCE AND TECHNOLOGY

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BOAT SPEED VARIES WITH COSINE SQUARED OF ANGLE OF HEEL.

Letter from: Dr. Joseph Norwood; 1021 Valencia Ave; Coral Gables, FL 33134.

Dear Jack,

Both you and Harry Morss have asked about Edmond Bruce's mention in DESIGN FOR FAST SAILING - AYRS 82 that sail force (and hence boat speed) decreases as the square of the cosine of the angle of heel. At least two recent articles on sailboat performance prediction have suggested that this was not the case. It is easy to prove Edmond's point. (See drawing, Page 6.)

To determine sail force, and hence boat speed, we are concerned with that component of the wind velocity perpendicular to the sail. Clearly, this is V_a cosine a, where V_a is the velocity of the apparent wind, assumed to be in the horizontal direction, and "a" is the angle of heel. We know from elementary aerodynamics plus Edmond's experimental sail tests at full size, that sail force is proportional to the square of wind velocity.

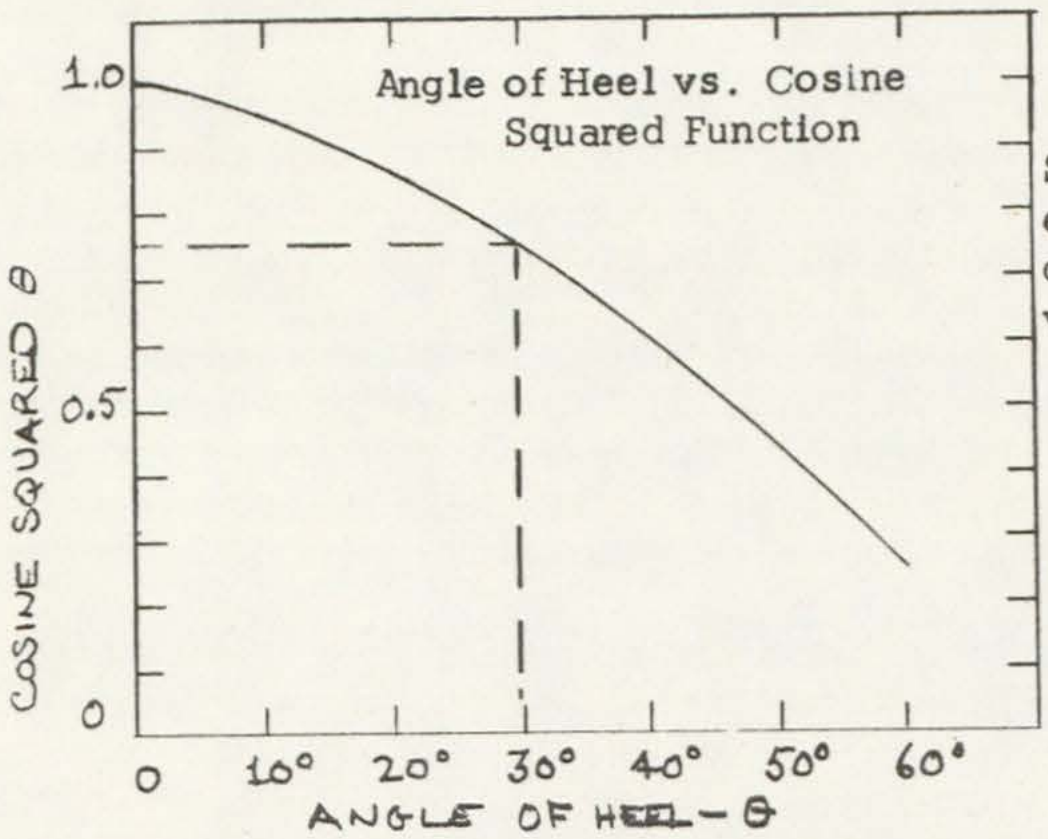
$F = 1/2 \rho C_L V_a^2 A_s$ where C_L is a coefficient of lift, ρ is the mass density of the air, and A_s is the sail area.

We must then for the heeling condition substitute $(V_a \text{ cosine a})^2$ for V_a^2 in this equation and find that sail force F and hence boat speed V_b are proportional to the cosine squared of angle of heel.

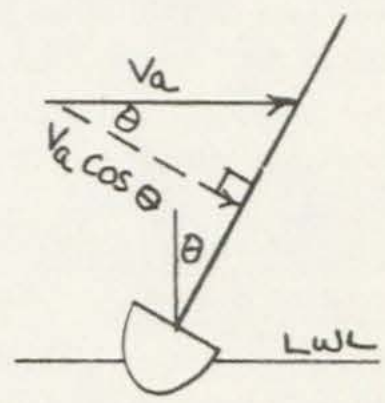
Apparently the mistake made by many is to assume that sail area is reduced by

the cosine of heel angle. That approach is incorrect.

Sincerely, Joe Norwood



Sail Force ∝ $\cos^2 \theta$ (Angle of Heel) e.g. For 30 heel, Sail Force is reduced about .75 or to 75% of the vertical value.



THE APPLICATION OF HYDROFOILS TO SAILING CRAFT I by Joseph Norwood, Jr.; 1021 Valencia Avenue, Coral Gables, Florida 33134.

This article is the first of a planned four-part review of the current state of hydrofoil application to sailing boats. These articles will include the following topics:

I. Forces and torques on sailing boats. The attainment of equilibrium by means of hydrofoils.
II. The stability of sailing boats. The application of various foil types. Wave action, ventilation, cavitation.
III. A comparison of hydrofoil configurations: aeroplane, canard, catamaran, asymmetric.
IV. Discussion of hydrofoil theory. Foil sections. Home construction of hydrofoils.

My general approach to the problems of yacht design is always to bear in mind my image of the ideal sailing machine (Fig. 1) and to do as little to corrupt it as I can in working out my design problem. This starting point features two semi-elliptical

(See Figure 1, Page 7)

high-aspect foils, the upper one operating in air. The lower one is rotated through a small angle with respect to the upper foil. It has perhaps 1/600 the area of the upper foil and operates in the water to resist leeway and allow the yacht to make to windward. There are five forces shown in Fig. 1. The driving force F_R generated by the upper foil and the resistance R offered by the passage of the lower foil through the water are equal and opposite, or:

$$F_R = R \qquad (1)$$

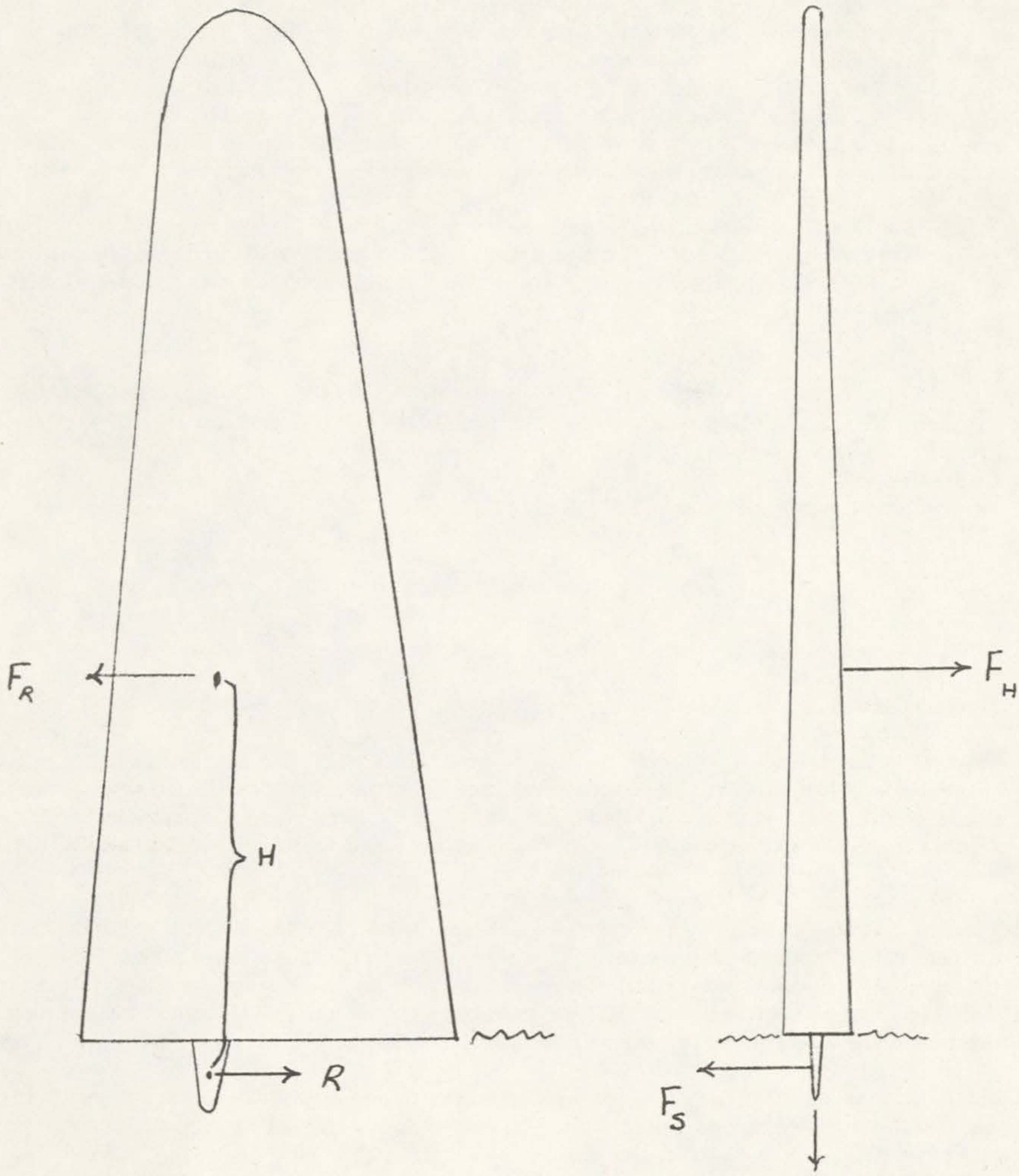
but do not lie on the same line. Likewise the sideward component of the sail force F_H and the side force F_S of the vertical hydrofoil are equal in magnitude, or:

$$F_S = F_H \qquad (2)$$

but also lie along horizontal lines separated in the vertical direction by a distance H. The weight W is, of course, normally compensated by the buoyancy of a hull or hulls. These forces also constitute two torques or twisting moments. The torque HF_R tends to pitch the bow down. It is compensated in a hullborne yacht by a shift forward of the center of buoyancy. The larger torque HF_H tends to heel the yacht to leeward. In conventional yachts this heeling torque is opposed by the shift of the center of

mass and a short moment arm in the case of monohulls, a small mass and a large moment arm in the case of multihull yachts.

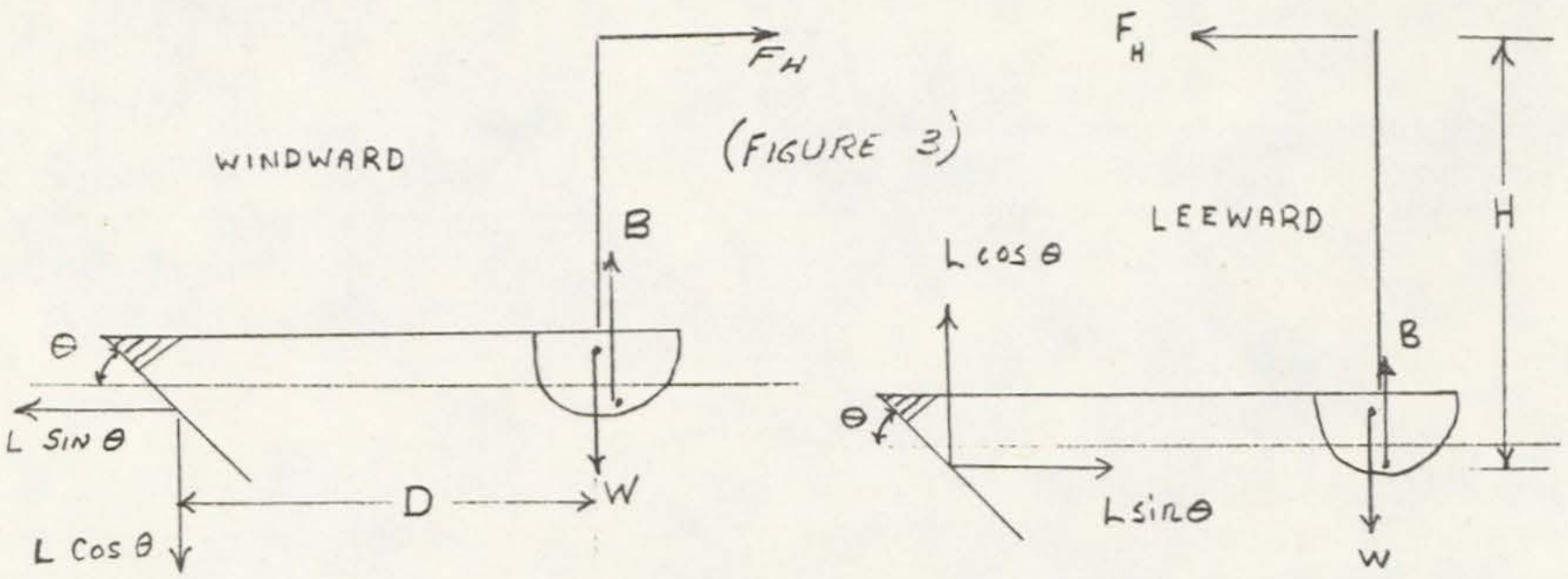
Figure 1 - The ideal sailing machine.



The first hydrofoil application to occur to the amateur experimenter is usually weight compensation by dynamic lift, that is, flying. This is not the proper first application of hydrofoils to sailing, however. In Fig. 2 taken from Ref (1), we have plotted the lift-to-drag ratio (weight-to-resistance) of a typical catamaran hull as a function of $V/\sqrt{L}$. Also shown is a horizontal line at L/D = 10 labeled "HYDROFOILS";

(See Figure 2, Page 9)

this lift-to-drag ratio is characteristic of a set of deeply immersed hydrofoils together with the necessary struts. From this figure we see that the buoyancy/resistance figure for a good catamaran hull is superior to the L/D of lifting hydrofoils up to a value of $V/\sqrt{L}$ of about 2.5. This result applies for hull length/beam ratios of 8 or more. The attainment of such speeds (12.5 kts for a 25 foot hull) requires that large heeling torques be countered long before "take off" speed is reached. The stabilization of large heeling torques thus provides the primary application of hydrofoils to sailing craft. Although such foil stabilization was used in the outrigger craft of Madagascar and Dar es Salaam, Edmond Bruce was the first to formulate the physics involved. The hydrofoil stabilization system envisioned by Bruce is shown in Fig. 3. For both the windward and leeward Bruce foil arrangements, it can easily



be shown that the condition for complete cancellation of the heeling torque is:

$$D/H = \tan\theta \qquad (3)$$

where D is the length of the crossbeam, H is the height of the center of effort, and θ is the Bruce foil dihedral angle. In order for a windward Bruce foil to be effective, it must serve to convert the heeling force to a depressing force. Consequently, the buoyant force exerted by the hull must increase as L increases with the speed of the boat:

$$B = W + L\ \mathrm{Cos}\ \theta. \qquad (4)$$

If the stabilizing hydrofoil is located on the leeward side, then the foil tends to lift the boat rather than to depress it,

$$B = W - L\ \mathrm{Cos}\ \theta. \qquad (5)$$

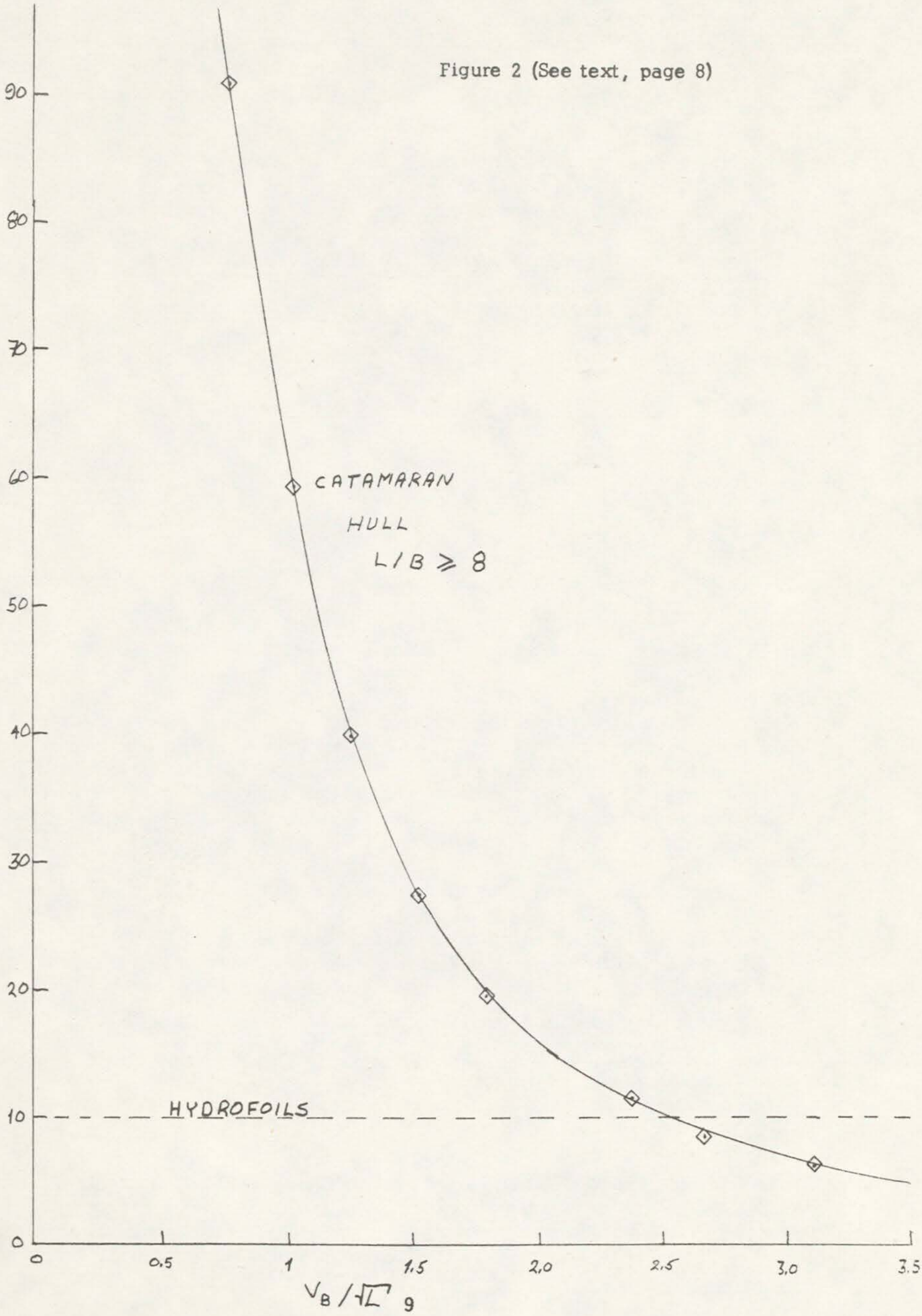
Thus $B \to 0$ as $L\ \mathrm{Cos}\ \theta \to W$ and the hull lifts out. The maximum righting moment exerted by the foil configuration occurs just as the main hull lifts out and is given by:

$$N_{max} = WD \qquad (6)$$

which is just equal to what a non-submersible float could do, except, of course, that the leeward foil arrangement also lifts and reduces the wetted area of the main hull in order to lift it clear of the water as $V_B \to 2.5\ /L$.

The dihedral angle must be chosen in the range 30 deg $\leq \theta \leq$ 50 deg since the sideforce of the sails and the weight of the yacht can be of the same order of magnitude when hard on the wind. In order to achieve a total cancellation of the heeling moment, this crossbeam length would have to be of the same order of magnitude as H which is generally not practical. For this reason, most Bruce foilers are somewhat undercompensated which makes little difference in practice.

Figure 2 (See text, page 8)



The pitching torque is generally somewhat easier to deal with than the heeling torque owing to the fact that the length of the vessel gives us a good long lever arm to work with. As we shall see, the lift of a thin foil increases almost linearly with the angle of attack. The pitching torque can therefore be compensated fairly easily by using a somewhat higher angle of attack on the bow foil than that used in the stern foil.

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RESEARCH AND THE INVENTOR - BULBOUS BOWS - COMPUTER HULL DESIGN.
Letters from: Ephraim C.S. Clark; P. O. Box 152; Horseshoe Beach, FL 32648.

Dear Jack,

Referring to the Editor's Note in FCCG 2, page four, let me point out that there are many courses research can take. Where a design engineer finds faults, problems and inefficiencies, he rigs up something to overcome them. When this presents more problems, he will rig some more. The inventor may do away with the troublesome parts and make it work better without them. While they are both improving the product, one is a money-making thing while the other is a money-spending thing.

Where the search part comes in is finding out what has been done so as not to repeat it. Because something has been tried before is no reason not to try it again if you can find out the reason that the first one was not successful.

If a thing looks like it would work and is not on the market, leave it alone. If it looks like it would not work - try it, as it probably has not been tried. It will probably not work out, but you may find out why, and this may lead to something that will.

I have been accused of being a perfectionist in simplification, but I am only a poor man's boat builder. That is why I am poorer than a beach rat.

Sincerely, Ephraim.

Dear Jack,

I have just received FCCG 3 and allow that it is very good. Enclosed is a clipping on DYNA-SHIP. Now that they have improved the sail, they could improve that old clipper hull and make it as efficient as the motor ships with a bulbous bow, etc. I think the Aussies have something in their bulbous bow sailboats. I think they will

find the most help will be to cut down on the hobby-horsing that is the worst on that kind of hull.

I was much interested in the letter from Capt. Mahinske on computer designing of hulls. It sounds good, but I am not very good at math, so I have to draw from things that have been millions of years in the development. One of my best boats was copied from the lower half of a mackerel which is a fast fish for its size. I know a fish does not have to have stability to carry sail, but the water does not know if it is going around a fish or a boat. Looking at the lines on the back cover, it would seem that this hull has too much ends and not enough middle. L. Frances Herreshoff said the boat lying down under press of sail should get longer and straighter in the water, and his fastest boats proved that. I imagine this could be worked out in a computer, but you cannot freakout God's computer.

Sincerely, Ephraim

Editor's Note: Sailboats have been slow to adopt the bulbous bow concept. YACHTING, December, 1975, p 20 has an item and picture of the new Elvstrom 6 meter JAWS with this configuration. DYNA-SCHIFF was described by her designer, Wilhelm Prolss in AYRS 70 and 76. DYNA-SCHIFF is a five-masted, wind-propelled cargo ship design with electrically-operated rotating masts. John Morwood wrote about fish versus hull shapes in AYRS 66. The DRAGON hull which Ed Mahinske used to illustrate his computer hull design method, apparently has too high a prismatic coefficient to suit Ephraim.

DRAG ANGLES by Henry A. Morss, Jr.; 6 Ballast Lane; Marblehead, MASS 01945.

John Morwood gave us a provocative piece entitled "The Urgent Yacht Research - Hull and Sail Drag Angles" in AYRS 62, Oct. 1967. He had realized how little was known of actual values of these angles in all types of sail boats.

He it had been, in his article "The Course Theorem" (AYRS 41, Oct. 1962) who focused attention on the importance of knowing and using the drag angles in describing the performance of sailing craft. Before that time, people had tended to cast these ideas in terms of lift/drag ratios, which were commonly used in aeronautics. In the "Course Theorem" he showed that the sum of the two drag angles was equal to the angle between the boat's course and the apparent wind. This simple and elegant relationship was not known to people who thought most of lift/drag ratios.

The basic idea comes from aeronautics. It has long been known that when a "foil" moves through a fluid, the major component of the resulting force (in a typical case) is a "lift", defined to be perpendicular to the direction of the relative motion. (This is, of course, what makes it possible for an airplane to lift off the ground and to stay in the air.) See Fig. 1. There is also a "drag" component of the force, defined to be along the line of motion. Since for any reasonable airplane wing the lift component of the force is several times as large as the drag component, the lift/drag ratio is a convenient figure of merit for the wing. (Figure 1 is on page 11.)

The drag angle is simply the angle by which the resultant force, F, "lags" behind the lift component. It is marked δ in the drawing.

When this kind of thinking is applied to sail boats, we see that we must use it twice, once to deal with the force produced by the wind on the sail (and everything else exposed to the wind), the second time for the force produced by the water acting on the entire underbody as the boat moves along.

Fig. 2 shows the way this works for the sail force. The direction of relative motion is the direction of the apparent wind. The lift component of the "sail force" is, by definition, perpendicular to that direction and the drag component parallel to it. These components, the resultant force, F_S, and the "sail drag angle," δ_S, are all noted in the figure. (Figure 2 is on page 12.)

Similarly, Fig. 3 shows the application to the "hull force." Now the direction of motion is the boat's course (not her heading), the lift component is perpendicular to

that and the drag component parallel to it. These plus the resultant force, F_H, and the hull drag angle, δ_H, are shown on the figure below.

The "Course Theorem" teaches that the angle beta between the apparent wind, V_A, and the boat's course, V_B, is equal to the sum of these two drag angles for any boat on any course (sailing without acceleration). This key point makes the drag angles highly valuable. More of us should get into the habit of thinking of drag angles when we think of the performance of a sailing craft and should begin to think about finding out what the values are.

Editor's Note: Harry is the co-autnor, with the late Edmond Bruce of the new AYRS book: AYRS 82 - DESIGN FOR FAST SAILING in which his unique and valuable ideas for predicting sailboat performance with suggestions for major improvements are made in much detail. This is the first of a series of articles by Harry which will appear on this subject. At my suggestion, Harry is leading into the drag angle approach very gently, and we hope those new to this idea and indeed to the analysis of sailboat performance will be encouraged to comment and make contributions hereto. An indication of the value of Harry's researches, as if indeed those of us familiar with his writings needed any, is that the Society of Naval Architects and Marine Engineers has selected for January, 1976 presentation at its New England Sailing Yacht Symposium his paper on the subject: "Forces and Angles in Sailboat Performance." Harry worked closely with Edmond Bruce and John Morwood for many years. It has been my privilege and pleasure to have corresponded with Harry for almost three years, to have made occasional contributions and encouragements to some of his many, many projects in yacht research, to learn from him, and perhaps even more important to have him poke holes in some of my stumbling efforts at attempting to understand and explain yacht design.

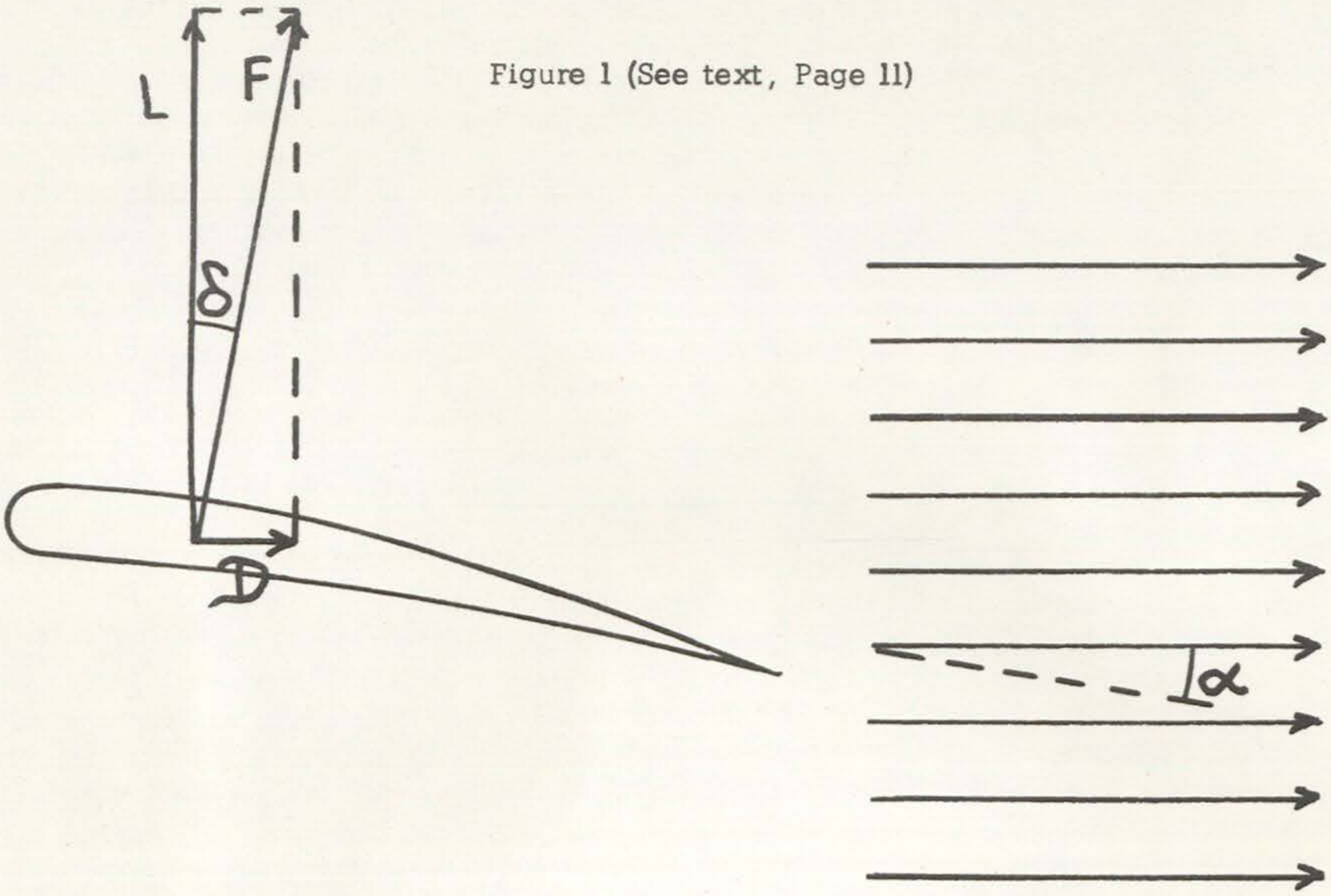


Figure 1 (See text, Page 11)

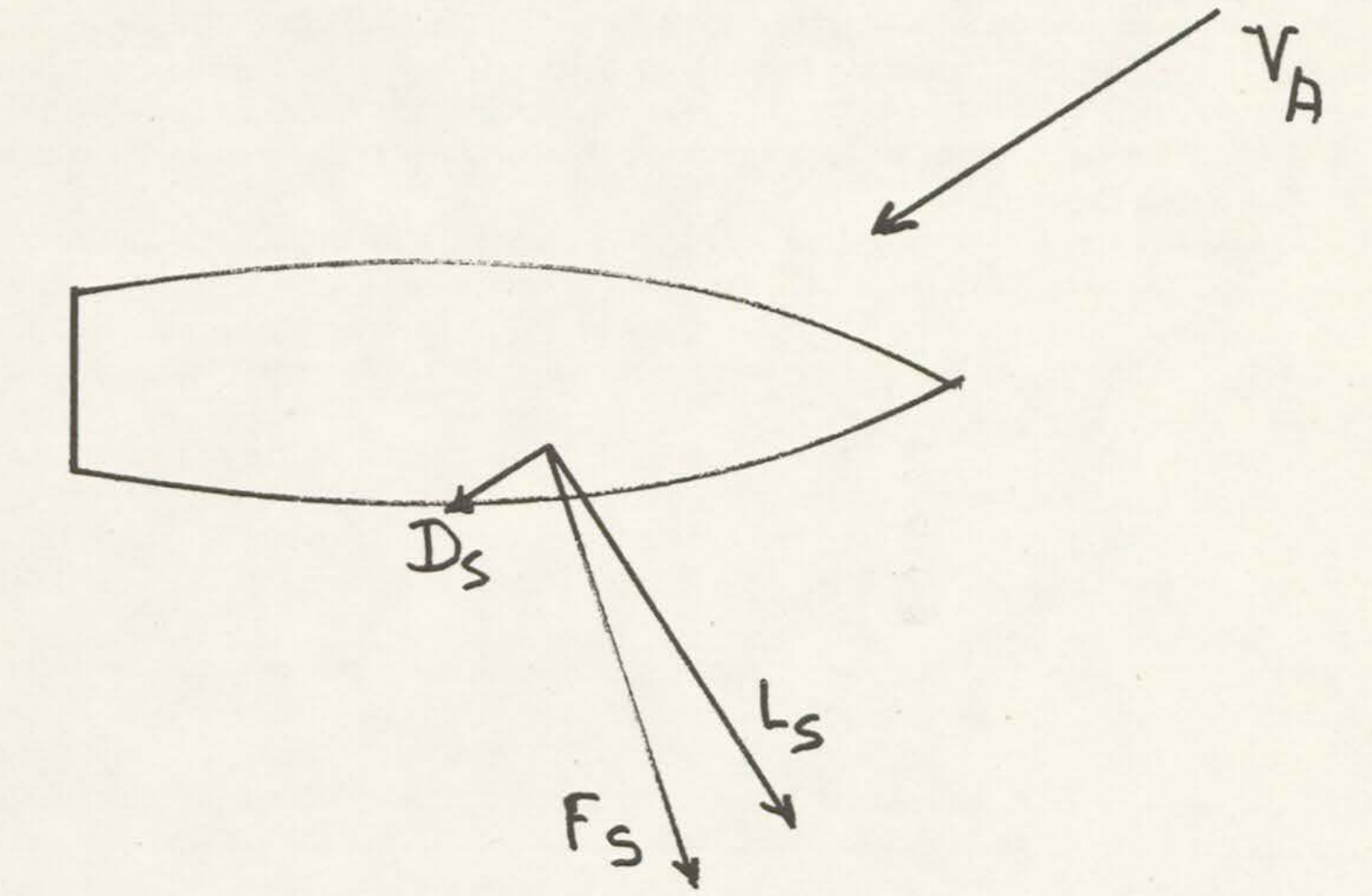


Fig. 2 (See Text, Page 11)

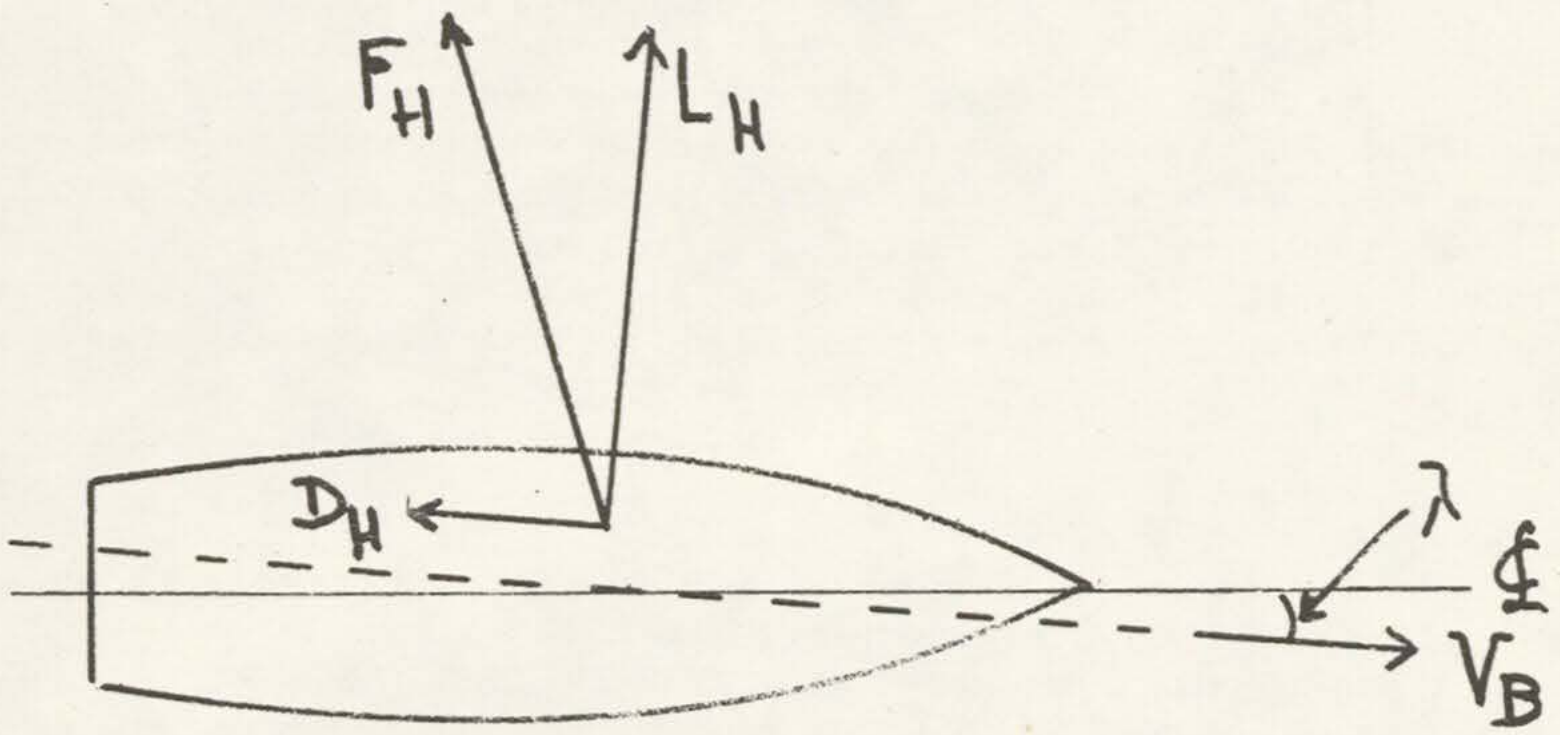


Fig. 3 (See Text, Page 11)

AYRS 83 A

DESIGNING FOR HIGH SPEED SAILING.

Letter from: Robert (Rod) Wright; Viking Multihull Club; 105 Frank Street; Bay City, Michigan 48706.

Dear Jack,

My feelings on sails are: single element asymmetric (Cat rig) for going to windward, and two element with slot (sloop rig or wing and slotted flap) for off the wind. The multi-element is used assuming that boat speed/true wind speed is less than about two; i.e. iceboats would always be single element for V_b/V_t at 3 or 4. The reasoning is that single element foils give much better Lift/Drag, but multi-elements give more lift per area.

My real ignorance lies in the realm of hull shape for minimum drag. Do you know of any studies that compare the Lift/Drag or drag per leeway angle, or drag with and without rudder and centerboard of various modern high speed catamaran hulls or trimaran floats? I've read Marchaj's book, but it didn't compare different types of catamaran hulls.

The major question is Lift/Drag - not L/D at different speeds but rather L/D at different immersion levels at varying speeds. The main problem when sailing a day-sailing cat (assuming you have enough crew or foil to hold it down) is lee bow burying - or rather the drag and windage or sufficient buoyancy forward in your hulls to keep the bow from burying.

It seems to me that hull buoyancy should be used for lift from zero to 8 or 10 knots. Above these speeds, the percentage of lift contributed by the hull would decrease as a major portion of the lift is taken by a hydrofoil. However, the hull would remain immersed to provide lift and keep the craft from becoming completely foil-borne. This would avoid the ups and downs of foil craft caused by lack of wind or ventilation. Foil-borne craft are very exciting when they're up, but mostly they're up and down and frustrating! This would also reduce the foil area needed and thus improve the slow speed characteristics of the boat. Additionally, this would allow the boat to go out in higher winds than foil-borne craft, which tend to tippy-toe over the water at high speed. Obviously, Bradfield, Keiper, Baker and Nigg would disagree with me - and for flying boats they may be right. The only way I'll know is to either build and test, or find lift and drag data on hulls at various immersion levels and speeds. Then, by adding data on foil performance - i.e. area immersed per weight per sail area divided by boat speed over wind speed - I may be able to decide if I'm on the right track. I've got to re-read my AYRS literature, but if you know of any studies, please let me know.

Do you know of any studies about the effects on hydrofoils or hulls at the air-water interface? It seems to me that this area is vital because fluid theory (deep immersion aerofoil theory) does not deal with this point - i.e. rounded or flat sections produce spray and waves, especially at high speed.

I've enjoyed reading AYRS literature because it's so rich in ideas. It's given me a very broad perspective on what's possible and not possible when it comes to sailing.

Sincerely, Rod Wright

Dear Rod,

Many thanks for your letter and for the loan of your slides of the 1975 Long Island speed trials for our first sailing meeting at Miami.

Some of your questions are answered in AYRS 82; DESIGN FOR FAST SAILING, or potential areas of research are indicated therein. For the design of suitable hulls for high speed sailing craft, the best we have are Edmond's tank tests as first published in AYRS 45, republished in AYRS 78 and in the above volume. To supplement these, the David Taylor Model Basin Tests on the Series 64, long and narrow hulls

up to $V/\sqrt{L} = 5.0$ are excellent. Unfortunately, the latter tests were not comprehensive in that prismatic coefficient was held constant at 0.63 while Edmond's varied slightly from 0.53 to 0.55. Displacement-length Ratio ($DLR = \Delta/(.01L)^3$ - tons/ft^3 See FCCG 2, p.7) in Edmond's tests varied from 23 to 666 while in the Series 64 tests, perhaps more typical of light-weight, high speed sailing hulls, DLR ranged between approximately 15 and 35.

When completed, I will send you copies of some papers I am writing for the Society of Small Craft Designers on adapting the Series 64 tests to yacht design. From my earlier work on these, I sent preliminary results and curves to Steve Dashew for his possible interest in the design of BEOWULF VI and to David Chinery for MANTIS VI. There were some errors in this rather hurried work, but the conclusions were interesting.

For spray effects, etc., I can recommend the SNAME three volume publication: HYDRODYNAMICS IN SHIP DESIGN. Do not be put off by the imposing title. These are excellent, practical and down-to-earth studies, not theoretical flights of mathematical fancy. SNAME PRINCIPLES OF NAVAL ARCHITECTURE 1967, is the definitive work in this field and helps correct the mistakes in popular works in this field.

Joe Norwood will address himself to some of these problems in the series he begins in this issue, and Harry Morss' papers should be of help as well.

Sincerely, Jack Shortall

PRIMER OF YACHT RESEARCH - John W. Shortall III.

My good friend John Morwood often urges me to draw pictures and get away from long, detailed, wordy explanations, especially on technical subjects. Unfortunately, I am a very poor artist. During WW II, John wrote a book entitled, I think,: FIELD IMPROVISATIONS which contained not one word of text. John's book: SAILING AERODYNAMICS, now sadly out of print, is a masterpiece of clarity due to his clever use of illustrations.

Being rather simple-minded on many things and more often confused than not by the complicated vector diagrams used often to try to help us understand sailboat behavior, I attempted to draw up a PRIMER OF YACHT RESEARCH as given in the four illustrations. They have helped me a good deal when studying the works of Edmond Bruce, Harry Morss, John Hogg, H.F. Kay, and C.A. Marchaj. They may help some of you when reading AYRS 82 - DESIGN FOR FAST SAILING by Bruce and Morss. However, they may only confuse; if they do, throw them away.

At least, I hope that Figure 2 will help clarify the ambiguous symbols which often conflict with each other in the writings of these good people.

These have been reviewed and corrected by Harry Morss, and John Morwood and Joe Norwood have seen them. Hope they help.

(See Pages 16, 17, 18, and 19 for PRIMER as outlined above.)

PAINT YOUR HULL UNDERWATER.

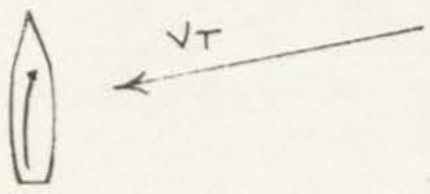
Bad news for the boat yards is a Swiss-manufactured epoxy underwater coating which will even adhere to steel and concrete. It is used for corrosion-sealing of dams, piers, steel ship hulls and canal lock doors underwater. Perhaps a dash of red pepper, as is done on Florida's East Coast, will improve its anti-fouling properties? It is distributed in the U.S. by: International Underwater Contractors of City Island, New York, and the Swiss firm is: Hydrasin.

WIND VELOCITY VECTORS

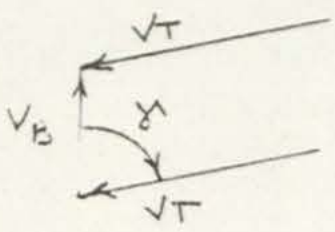
WIND IS NOT A FORCE. WIND IS MEASURED AS A PRESSURE.

$P = 0.0034\ V^2 \quad [LBS/FT^2] = [KNOTS^2]$

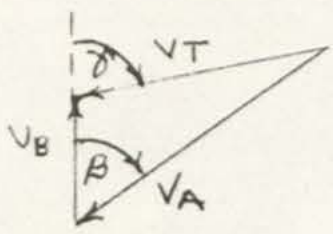
J.W. SHORTALL III 1975



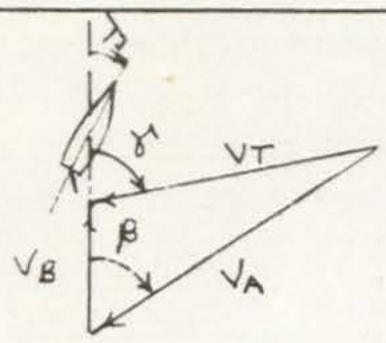
1. OUR BOAT AT REST EXPERIENCES A TRUE WIND VELOCITY: V_T



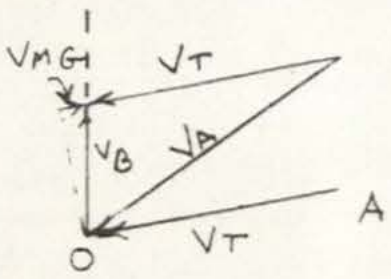
2. WE HOIST SAILS AND PROCEED ON A COURSE AT AN ANGLE γ TO THE TRUE WIND AND AT A VELOCITY THRU THE WATER: V_B



3. MOVEMENT OF OUR BOAT CAUSES THE WIND FELT BY THE SAILS TO SHIFT ITS SPEED AND DIRECTION, AND WE EXPERIENCE AN APPARENT WIND OF VELOCITY V_A AT AN ANGLE β TO THE COURSE LINE.



4. TO HOLD COURSE RUDDER IS USUALLY ANGLED AND OUR BOAT "CRABS" MAKING LEEWAY. — ANGLE BETWEEN BOAT CENTERLINE & COURSE is THE LEEWAY ANGLE: λ



5. THE ARTIFICIAL VELOCITY V_{MG} IS INTRODUCED SO WE MAY CALCULATE RATE OF PROGRESS FROM DEPARTURE POINT "O" UPWIND (TRUE WIND) TO POINT "A".

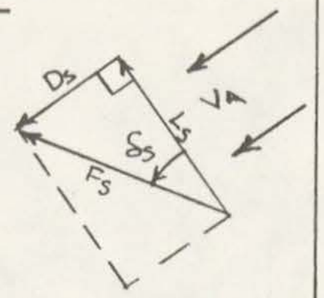
REMEMBER: VELOCITY IS A VECTOR QUANTITY — i.e. IT HAS A SPEED (KNOTS) AND ANGULAR DIRECTION (DEGREES).

QUANTITY	ANGULAR MEASURE
V_B – BOAT VELOCITY THRU WATER	$\lambda°$ TO BOAT HEADING ON CENTERLINE
V_T – TRUE WIND VELOCITY	$\gamma°$ TO BOAT COURSE
V_A – APPARENT WIND VELOCITY	$\beta°$ TO BOAT COURSE
V_{MG} – VELOCITY MADE GOOD TO WINDWARD	$180° - \gamma°$ TO BOAT COURSE

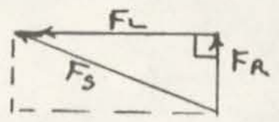
HORIZONTAL FORCE VECTORS - SAIL + HULL

SAIL - AIR

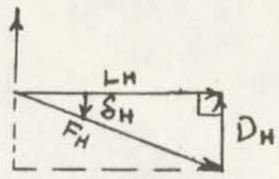
APPARENT WIND PRESSURE ON SAIL PRODUCES FORCE F_S WHICH WE RESOLVE IN + PERPENDICULAR TO V_A DIRECTION. (D_S + L_S). ANGLE F_S TO L_S IS SAIL DRAG ANGLE: δ_S



NOW WE RESOLVE F_S IN + PERPENDICULAR TO COURSE DIRECTION (F_R + F_L).
F_S ACTS ON CENTER OF EFFORT (CE) OF SAIL PLAN. F_R IS THE FORCE WHICH MOVES THE BOAT



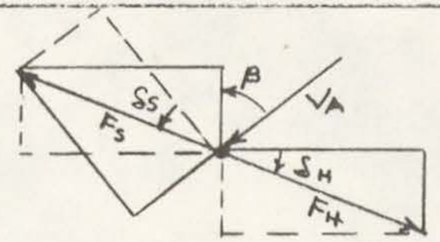
HULL - WATER



IF BOAT IS MOVING IN A STRAIGHT LINE AT ANY CONSTANT SPEED, THE WATER MOVING PAST THE HULL PRODUCES A FORCE F_H EQUAL AND OPPOSITE TO THE SAIL FORCE F_S. WE RESOLVE F_H IN AND PERPENDICULAR TO COURSE DIRECTION (D_H+L_H). THE ANGLE OF F_H TO L_H IS THE HULL DRAG ANGLE: δ_H.
F_H ACTS ON CENTER OF LATERAL RESISTANCE (CLR) OF HULL.

SAIL PLUS HULL

ASSUME CE + CLR COINCIDE IN HORIZONTAL PLANE
NOW WE CAN JOIN F_S + F_H TO OBTAIN AN OVERALL PICTURE OF THE COMBINED HULL + SAIL FORCES. USUALLY CE + CLR DO NOT COINCIDE. THEN F_H + F_S MUST LIE ON SAME LINE.



$\beta = \delta_H + \delta_S$

FORCE & ANGLE TERMS

	AYRS	H.F. KAY	MARCHAJ	SNAME
1. HULL FORCE; RESULTANT WATER FORCE; TOTAL HULL RESISTANCE	F_H / R_T	R_W	R_T	
2. RESULTANT SAIL FORCE:	F_S	R_A	F_T	
3 HULL DRAG; FORWARD RESISTANCE; WATER DRAG FORCE:	D_H / F_{HF}	D_W	R	R_T
4 LATERAL RESISTANCE; LIFT; SIDE FORCE:	L_H	L_W	F_S	
5 YACHT, BOAT OR SHIP VELOCITY:	V_B	V_S	V_S	V
6 HULL/HYDRODYNAMIC DRAG ANGLE:	δ_H	δ	ϵ_H	
7 SAIL/AERODYNAMIC DRAG ANGLE:	δ_S	ϵ	ϵ_A	
8 ANGLE ATTACK SAIL TO APPARENT WIND:	λ	λ	λ	
9 SAIL DRAG FORCE:	D_S	D_A	D	
10 SAIL LIFT FORCE; CROSS-WIND FORCE	L_S	L_A	L	
11 BOAT THRUST; DRIVING FORCE:	F_R	—	F_R	
12. HEELING FORCE; SAIL SIDE FORCE:	F_L	—	F_H	

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AYRS 83 A

PRIMER OF YACHT RESEARCH

CALCULATION OF FORCES

For many years, it has been the usual practise of fluid mechanics scientists and naval architects to calculate forces in water and air through the uses of artificially-introduced and defined coefficients in the following way:

$F = \frac{1}{2} \rho C A V^2$ ρ air or water density $\left[\frac{LB \cdot SEC^2}{FT^4}\right]$ C-coefficient - DIMENSIONLESS

V velocity [FT/SEC] A area [FT^2]

Thus, if we towed a model yacht hull in a water tank and measured its resistance R or D_h at various velocities, we would calculate a variable coefficient C_t called the total resistance coefficient, for each velocity and plot this on a graph versus velocity, $V_B/\sqrt{L}$ or $V_B/W^{1/6}$.

$C_T = \frac{2F_{HF}}{\rho S V_B^2} = K_{HF}$ V_B velocity boat in water ρ water density

S area of wetted surface of hull F_{HF} hull drag (D_H)

A similar equation may be used for calculating sail force coefficients:

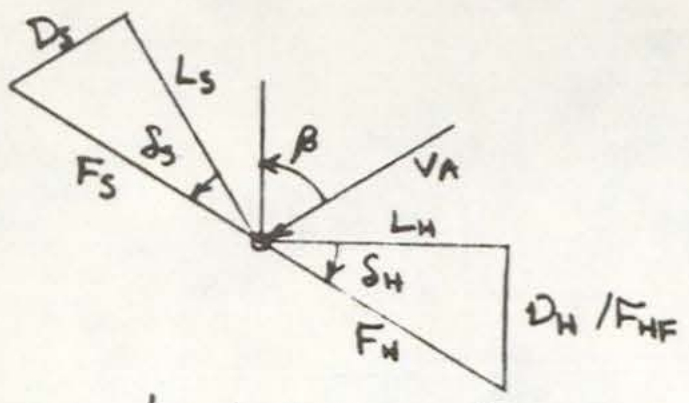
$C_S = \frac{2F_S}{\rho A_S V_A^2}$ V_A apparent wind velocity ρ air density

A_S sail area F_S sail force

Remember that coefficients are artificial and are invented and defined for better understanding of yacht behavior and to help improve yacht performance. Coefficients can be vectors, i.e. have direction as well as magnitude, and are variable - <u>not</u> constants.

COEFFICIENTS USED IN YACHT RESEARCH

FORCE VECTOR DIAGRAM

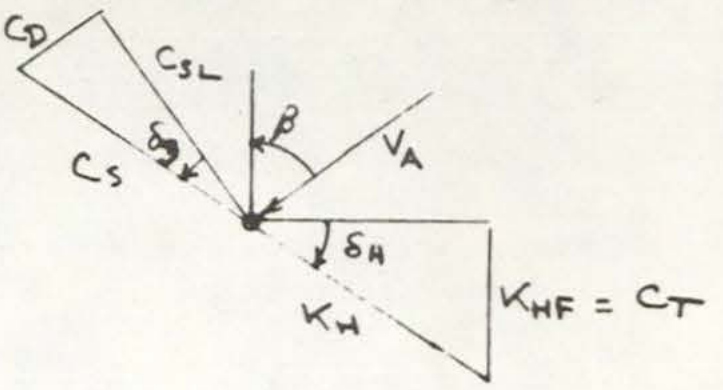


$\cot \delta = \frac{L}{D}$ (LIFT/DRAG)

$\sin \delta_H = \frac{F_{HF}}{F_H}$

F_{HF} IS OFTEN CALLED R_T IN TANK TESTING

COEFFICIENT VECTOR DIAGRAM



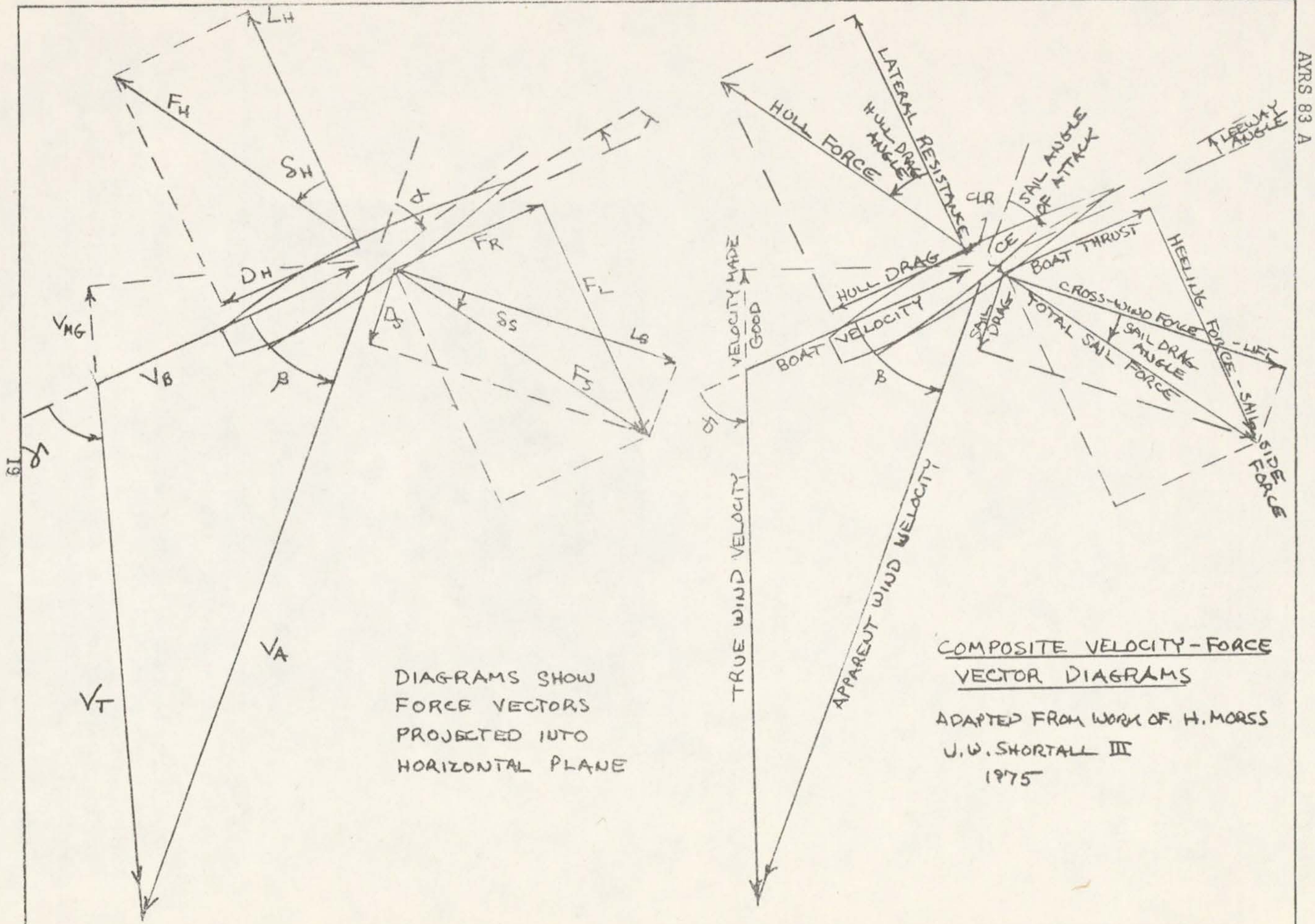
$\sin \delta_H = \frac{K_{HF}}{K_H}$

$K_{HF} \equiv \frac{100 F_H}{W^{2/3} V_B^2}$ $\left[\frac{LBS}{LBS^{2/3} KNOTS^2}\right]$

$C_S \equiv \frac{2 9 8 F_S}{A_S V_A^2}$ $\left[\frac{LBS}{FT^2 (FT/SEC)^2}\right]$

W IS DISPLACEMENT/WEIGHT

J.W. SHORTALL III
1975


LH
FH
SH
DH
α
FR
FL
β
SS
LS
FS
VMG
VB
β
γ
VA
VT
DIAGRAMS SHOW
FORCE VECTORS
PROJECTED INTO
HORIZONTAL PLANE
LATERAL RESISTANCE
HULL FORCE
HULL DRAG ANGLE
CLR
SAIL ANGLE OF ATTACK
LEEWAY ANGLE
CE
BOAT THRUST
HEELING FORCE - LIFT
CROSS-WIND FORCE
SAIL DRAG ANGLE
HULL DRAG
VELOCITY MADE GOOD
BOAT VELOCITY
SAIL DRAG
TOTAL SAIL FORCE
SIDE FORCE
β
TRUE WIND VELOCITY
APPARENT WIND VELOCITY
COMPOSITE VELOCITY-FORCE
VECTOR DIAGRAMS
ADAPTED FROM WORK OF H. MORSS
U.W. SHORTALL III
1975

AYRS 83 A

****
AMATEUR BOATBUILDING AND MATERIALS
****

33 FT. FAST CRUISING CATAMARAN UNDER CONSTRUCTION.
Letter from: Conrad Muller; P.O. Box 5352, Charleston, Oregon 97420.

Dear Jack,

Enclosed is a picture of one hull of the 33 ft. catamaran I have under construction. The frames and stringers are of clear Port Orford cedar, cured in the water and air-dried. The skin is 3/8 inch, five ply, marine plywood, and fastenings are silicon bronze ring nails and screws. Epoxy glue and resin are Chem Tech, and the boat will be covered with Vectra. TBTO preservative will be used under the Vectra and in the bilges. (See Picture below.)

She displaces 3500 pounds on her cruising waterline which will be about 2,000 pounds of boat weight plus crew and gear. The idea came from James Wharram, but the design is my own. She is intended to be a light-weight, fast minimum cruiser for two. The hulls will be connected by laminated fir beams, and the first rig will be a fairly normal masthead sloop.

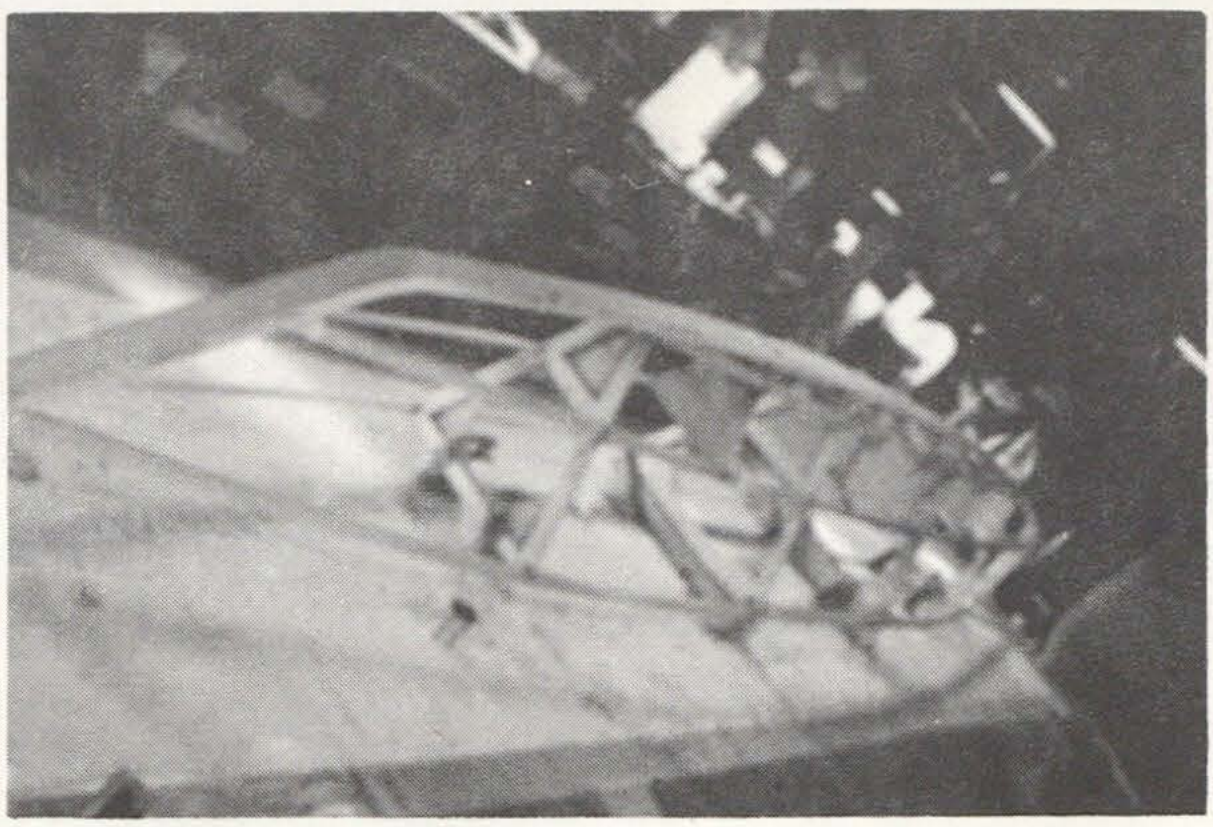
My personal opinion is that I must be nuts to put that much money into a 33 ft. boat, but it will be interesting.

Sincerely, Conrad Muller

Dear Conrad,

She looks great, and it is clear that you are using much care and thought in her construction. Marine plywood is the only way to go for this application. Exterior brands have no place in boatbuilding. Why don't you substitute coating with epoxy resin as in the WEST system instead of using TBTO? I applied Cuprinol in the bilges and wish now I had epoxy-coated.

Sincerely, Jack Shortall.



BACK YARD BUILDING OF 32 FT. CAT SCHOONER PIROGUE "JULIANA".
Letter from: Robert Thoma; 372 St. Charles St.; Elgin, ILL 60120.
Dear Jack,

Enclosed are some pictures of my 32 1/2 foot long, 8 ft. 4 in. wide cat schooner pirogue, flat-bottomed "JULIANA", which I am building here. When she is completed, we will sail her to the Republic of El Salvador where we will live. We own a small farm there and are buying some beach land on the Pacific Ocean.

AYRS 83 A

JULIANA has leeboards and is constructed of plywood over a white oak frame with one layer of fiberglass overall. The leeboards will make beaching easy. I have been working for over a year, and the hull is almost complete. Hope to be sailing by next summer. I had difficulty fiberglassing over a shallow oak keel. The resin would not harden where it came into contact with epoxy glue used to hold the keel in place, in addition to the keel bolts. I finally found that use of epoxy resin in place of polyester gave a good bond. Being short of powdered fiberglass to mix with resin for a filler paste, I used fine sawdust, and it worked well and sands nicely. Also, the price is right. Do you know where I could get a bronze pipe about 9 ft. long with a one inch I.D.?

JULIANA will weigh about 5000 pounds plus 3 - 4,000 pounds for ballast. Sail area is to be 220 sq. ft. Do you think I can carry more? (See Photos below)

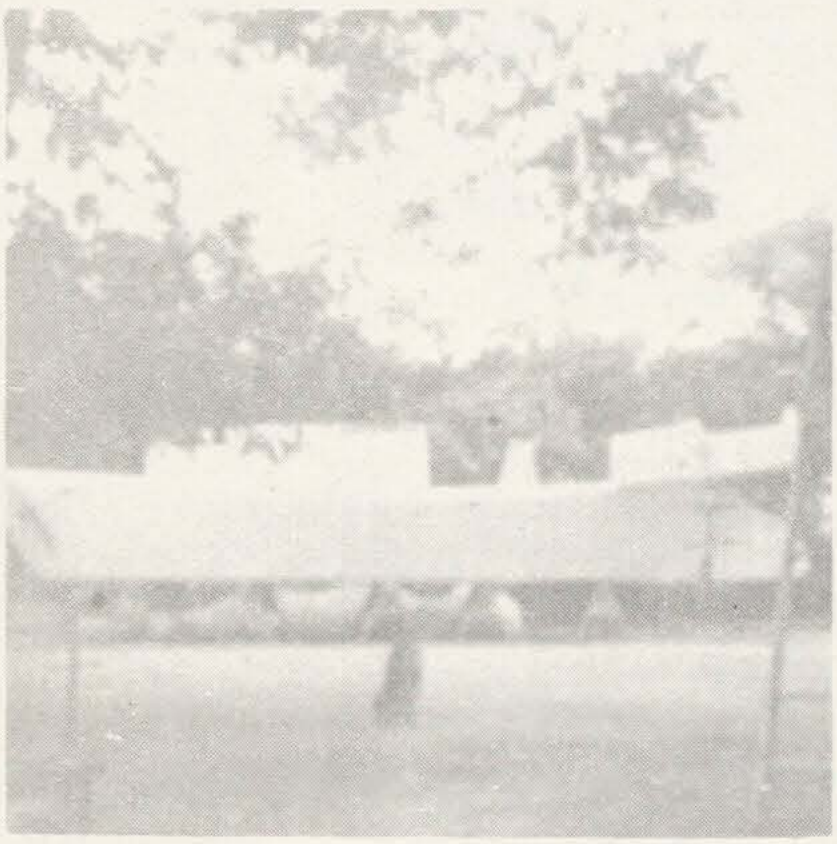
Sincerely, Bob Thoma

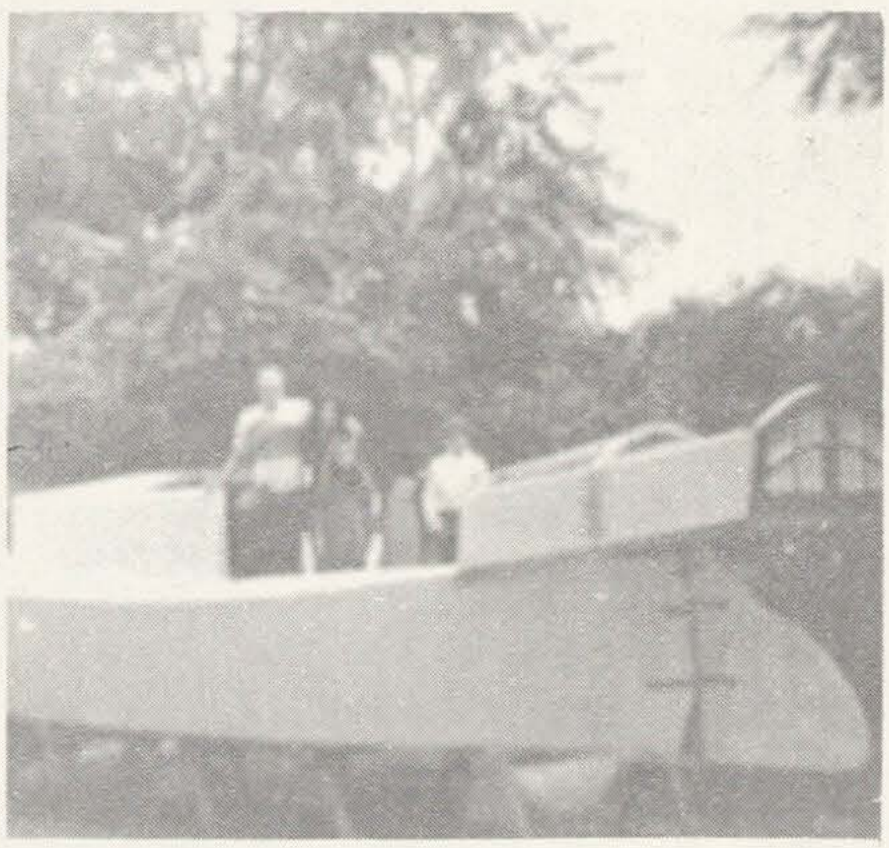
Dear Bob,

Many thanks for the description and photos of your cat schooner pirogue. I like the leeboards very much and think this is a neglected or arrested development for sailing yachts. Herreshoff's MEADOWLARK uses these to great advantage but no one picked this up, and we now usually see the much less efficient and awkward centerboards and keels.

I worry about your seeming high center of gravity but assume you have taken that into account. Your sail area is very low. You would need 430 sq. ft. at this displacement for a Bruce No. of 1.0. What I did not make entirely clear in FCCG 2 is that while ordinarily one wants to carry all the sail possible, stability is the villain that prevents us from so doing. The more sail the more the angle of heel for any given wind strength, and the less pleasant the sailing and the closer the yacht is to capsize or knockdown. Sudden gusts are a real danger when over-canvassed.

Hope this clarifies my somewhat abstract equations and statements on sail area and Bruce Number in FCCG 1 and 2. I cannot estimate how much sail area you can safely carry without seeing your hull lines and knowing where your center of gravity will be with all crew and equipment aboard. You are probably correct that this is all she can safely carry with this amount of inside ballast. However, you may be disappointed in her performance under sail. (Continued on page 22.)





Sails are similar to engines - they must generate power to move a hull. Like automobiles, the heavier the vehicle, the more power is necessary to move at a given speed. Contrary to popular belief, the chief problem faced by cruising people is not enough wind rather than too much. We fear and plan for the latter but find most of the time we have to practise light air sailing or are becalmed for hours or days at a time.

All boatbuilders become experts on the formulation and use of putties or filler pastes. For high strength applications, I mix into epoxy glue/resin, chopped fiberglass which my son and I cut from tightly-rolled fiberglass scraps with scissors. For cosmetic purposes, I have used a variety of additives including: sawdust, talc, and asbestos, but microballoons seem to be the easiest to apply and sand whether in polyester or epoxy resins. Among others, these are sold by: Defender Industries; 255 Main St.; New Rochelle, NY 10801. They are a good source of materials.

I do not know where to purchase the bronze pipe and am referring your question to Dick Kelting and our readers for advice.

Sincerely, Jack Shortall

BOAT LUMBER AND POWER TOOLS

Letter from: Ephraim C.S. Clark; P.O. Box 152; Horseshoe Beach, FL 32648.

Dear Jack,

In answer to your long, interesting letter of October 24th, I am having trouble finding lumber that I can afford to buy for the big boat. I need 4,000 feet of cypress to finish it. Am now trying to buy some logs from a man that does logging and have them sawed at a small farmer's mill. Ship and boat lumber is not squared but left wane-edged and is used to better advantage that way. So far, my big boat is all second-hand lumber from wrecked buildings. By going to the wrecking job and picking out what I want, I got better lumber than what is on the market at any price.

The BEACHCOAMER is built of Oregon Cedar. Most of the Florida lumberyards have it in 2 x 4 and 2 x 6 sizes for outdoor structures. It is third grade from tree tops, lightweight and has many sound knots. It makes a strong, lightweight and rot-resistant boat lumber.

My power tools are from Gilliom. They sell the minimum hardware along with patterns and instructions for making the cabinets and tables of wood. I even made the wheels and belt sheaves of wood in my bandsaw. If kept painted, the wooden machines last longer out of doors. White will last longer, but paint the tabletops dark for a good background to see the work. The instructions call for 1/3 to 1/2 hp. motors, but you will have better luck with 1 hp or more. I bought rebuilt motors for less than half the new prices, and they have been most satisfactory. I saved enough on lumber costs on the first boat to pay for them.

For cypress on small boats, I buy slabs from the small sawmills. The big mills cut all their slabs into chips for the chip board mills. I think if you get a thin circular saw and cut your own 1/8" veneer, you will find it stronger and easier to work with. You won't have to keep the compression side out to keep it from checking.

Sincerely, Ephraim

Editor's Note: The company Ephraim mentions is: Gilliom Mfg. Co.; 1109 N. 2nd St.; St. Charles, MO 63301. Their kit for building a 12 inch bandsaw comes to $138 plus freight, including all metal parts, 1/3 hp motor, and plywood for the case and table. The 18 inch kit with 3/4 hp motor and all wood necessary comes to $195. Since a new 18 inch bandsaw sells for about $1200, this is a real buy, and it is good to have Ephraim's endorsement. Gilliom also offers at very modest prices kits for: 10 inch tilt arbor floor saw; 12 inch drill press-lathe; 6 inch tilt table belt sander; and a floor model spindle shaper.

AYRS 83 A

WARRAM CATAMARAN, YULOHS AND MARINE PLYWOOD.

Letter from: Larry Stevens; Rte. 2, Box 55; Vero Beach, FL 32960.

Dear Jack,

Since the first of September, my wife Ellyn and I have been living on our 40 foot Wharram cat which is not even in the water yet. We have set November 2nd for launching. We have spent the last two years building our boat and now we hope to pay more attention to sailing it and would enjoy seeing articles with a practical interest for us. I also enjoy many of the more technical articles.

I remember reading of your intention to use a yuloh for propulsion and would be particularly interested to hear of your success or failure at this as I am going to build one for our boat.

Other members may be interested in the fact that I bought almost all our lumber and plywood locally at prices far less than those quoted by M.L. Condon. Ronald Senne Lumber Co. in Grant, Florida has a tremendous stock of marine plywood in lengths up to 24 feet, and his prices generally are good. He also has lots of bronze fasteners and galvanized hardware. He apparently is the main supplier for the commercial fishing fleet in this area, and I have had nothing but satisfaction dealing with him.

Sincerely, Larry Stevens

Editor's Note: I find it quite easy to propel my 5000 pound trimaran with my Chinese-type yuloh at two knots or so and note that Hal Roth sculled his 29 foot six ton yacht at one knot easily. See the just-published MARINER'S CATALOG Vol. III, pages 28 and 29 for information on this plus my own remarks. Rowing is hard work. Sculling is relatively easy and effortless. Many will be interested in your source of marine plywood. Exterior plywood has no place in hull or deck construction of yachts.

SOURCE OF TRADITIONAL BOAT PLANS.

The Smithsonian Institution stocks a number of lines drawings of traditional yachts described in the many wonderful books of Howard I. Chapelle as well as others, and the prices are modest. Service charge on the first set of plans is $7.50 with a service charge of $2.50 for each additional set of plans ordered at the same time. Printing charges add an extra $1.00 per sheet under 4 sq.ft. and $2.00 per sheet over this size postpaid.

For example, lines drawing at 3/4 inches to the foot and sail plan at 1/4 inch to the foot of the Boston Hooker shown on page 279 of AMERICAN SMALL SAILING CRAFT totals $9.50 plus 20¢ if mailing in a tube is desired. If, in addition, I wished on the same order to receive plans of the 32 foot sharpie single-hander STORM WIND, the three sheets would cost me $3.00 plus $2.50 additional service charge. This is a good buy.

Write for order forms and to inquire about particular boat designs to: Smithsonian Institution; The National Museum of History and Technology; Mr. Melvin H. Jackson, Curator of Maritime Transportation; Washington, D.C. 20560.

SOURCES OF BARE HULLS AND KIT BOATS.

New England Boat Builders, Inc.; John Feroce, President; Harbor Road, Mattapoisett, Maine 02739.

This is the former Allan Vaitses yard and produces stock and custom sail and power boats. For over 20 years, boats have been manufactured in planked and cold-molded wood, form core, wood core, C-Flex and fiberglass. They are pioneers in the development of fiberglass masts. Stock designs include: Herreshoff Meadowlark, Cartwright Nantucket 40 cutter and the Seaton Uncatena 45 trawler yacht among others. Boats are available at all stages of completion from bare hulls to fully-equipped.

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Sail Pacific Corp.; 2800 Washington Street, Port Townsend, WA. 98368.

Finished or kit boats are available of INGRID - a 38 foot double ender with "years of cruising experience."

Editor's Note: We continue to list sources of bare hulls and kits - four were included in the last issue with one trimaran from Simpson-Wild in Texas - because many potential boatbuilders are quite rightly put off by the difficulty of building the hull or hulls, which may take a year or more (five years in the case of a local 50 footer in ferro-cement) and then facing up to being only one-quarter to one-fifth finished. I have had no personal experience with these firms and would welcome more complete information from them and AYRS Members who have seen or built with their products.

THE ALADDIN PROCESS
LIGHT DISPLACEMENT CRAFT FROM SYNTHETIC FERRO-CEMENT

Letters from: Platt Monfort; Aladdin Products, Inc.; Haskell Road; Westport Island; Maine. Mail to: RFD 2, Wiscasset, ME 04578.

(Pictures of this process shown on pages 24 and 25.)

Dear Jack,

Not knowing how well acquainted you are with WIRE PLANK and FER-A-LITE, I am enclosing a copy of: "A REVOLUTION IN FERRO CONSTRUCTION." (Copyright 1975; Price: $2.00 from Aladdin Products.) The book contains complete instructions for boatbuilding with the Aladdin process with many illustrative pictures showing the building of the Herreshoff-designed 45 foot MOBJACK. Also included are scantling tables and a catalog of boat plans by myself, Roger Long, Brewer & Associates and Bruce Roberts, specifically for building in this medium.

Well over 150 boats, from 10 to 67 feet are in the works across the country .... progress is slow .... but hulls are being completed and good words are filtering through with referral orders.

I have just completed building the hull of the 45 foot MOBJACK. Not to brag, but the hull has turned out looking very well in my eyes and most others. It is very rugged and relatively cheap. I was very fussy with most of the details, which took a lot of time, but the results were well worth the effort. If you or any AYRS Members are ever in the New England area, I think it will be well worth the time and effort to stop and see the MOBJACK and the progress we've made.

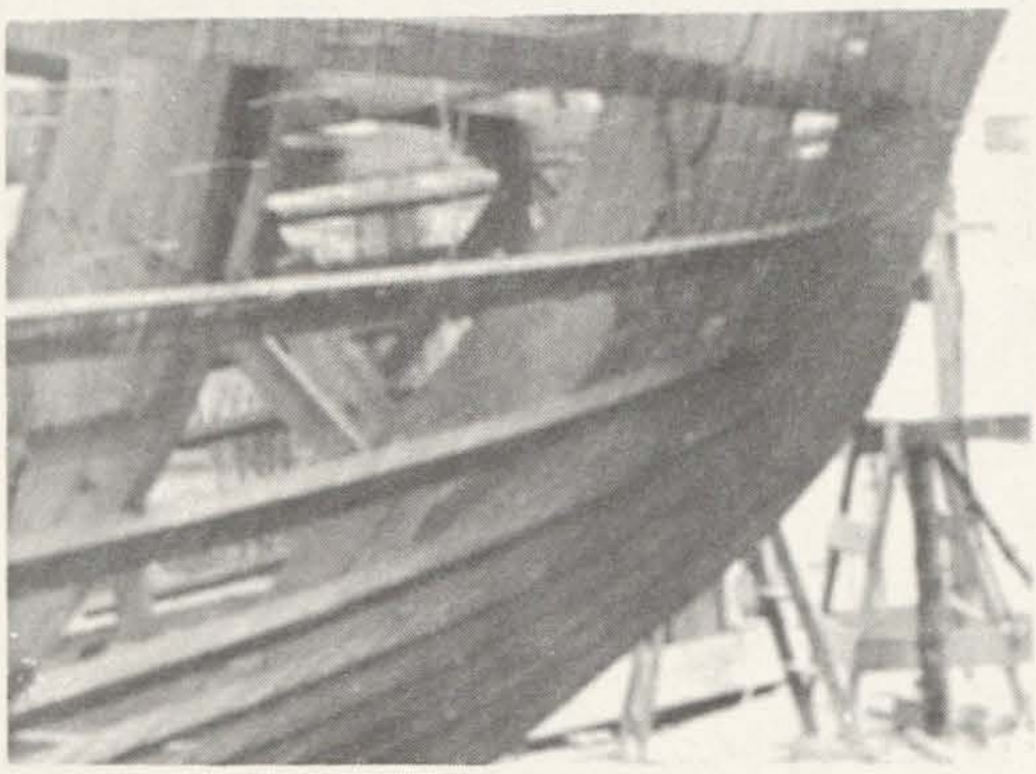
Sincerely, Platt Monfort

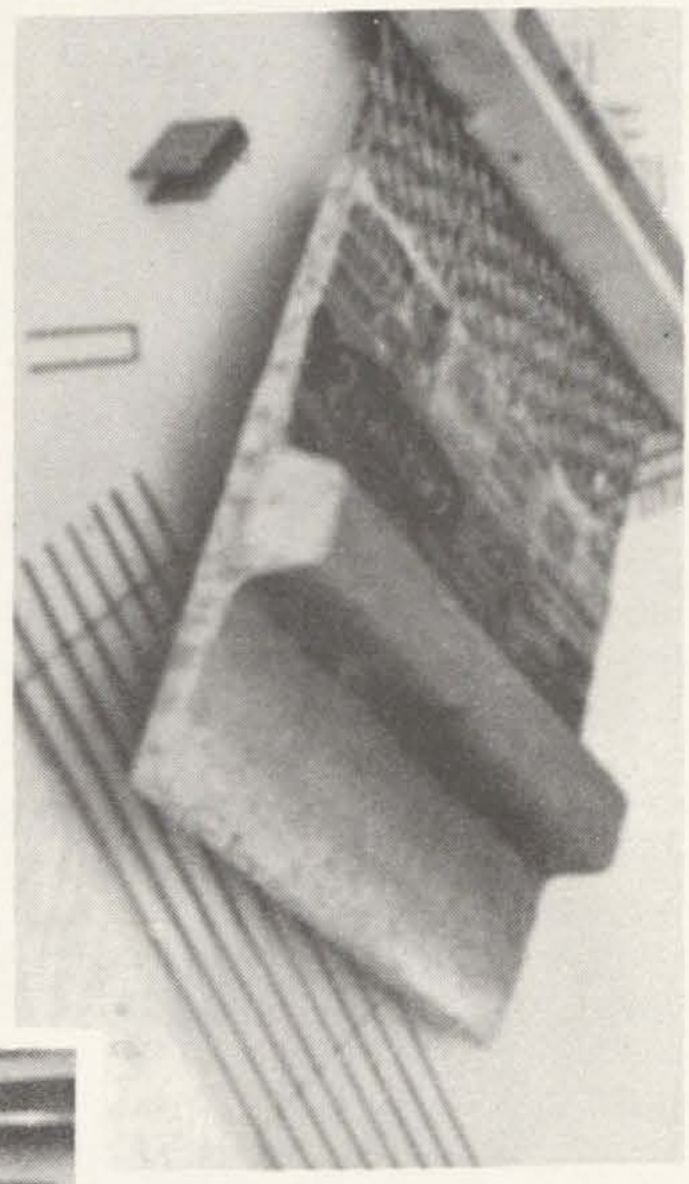
Dear Jack,

Thank you for your letter, and here are answers to your questions.

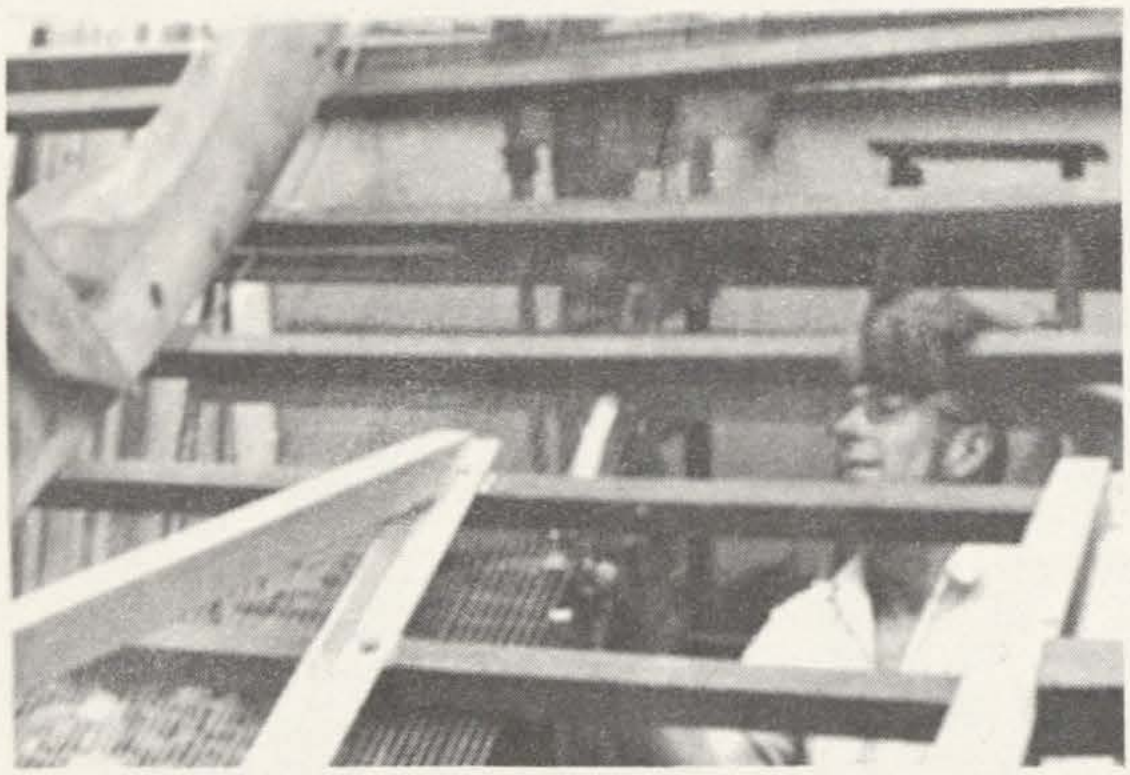
WIRE PLANK (tm) and FER-A-LITE (tm) are the key elements to this new composite boatbuilding method. It amounts to a steel mesh armature filled with a trowelable fiberglass compound. WIRE PLANK was developed as a means to achieve light weight ferro-cement hulls. By utilizing the continuous strands of WIRE PLANK, a thin shell mesh is provided without joints. Thin without joints proved to be the obvious solution to lightness in weight. The same effect would be obtained by using single wire strands; however, it is a lot easier with planks composed of eight wires conveniently held together with cross wires .... these are spot-welded in place at eight inch intervals.

FER-A-LITE is a mix of polyester resin (boatbuilding type) and a blend of filler material called: REINFOR-CEMENT. When mixed, it is free flowing and sticky with a sort of sandy texture. Cure time is adjusted by the amount of catalyst added and should be set for about two or three hours. Aside from its great strength (five times Portland cement in bending) a handy feature of FER-A-LITE is the fact that it bonds to itself. This lets you apply it in small increments and facilitates repairs.





Other Pictures on Cover.



The cost of the basic shell on the 4 5 ft. MOBJACK hull worked out to be $2.00 per sq. ft. on about 1,000 sq. ft. In addition to the WIRE PLANK and FER-A-LITE, the following items were included: Fiberglass - $100; Stringers - $175; Steel (backbone, floors, mast steps, etc.) - $316; Bolts - $50; Staples - $54. There are probably some more small items not shown. I would guess a total of about $3.00 would include it all. The deck members are not included in this figure. Being all wood, I felt there was nothing unique to report in that area.

My basic experiments were with a thin WIRE PLANK shell on the outside of an exposed rod grid. This provides sufficient thickness for stiffening without a lot of material used for cost and weight savings. The MOBJACK hull is based on the same idea except that it utilizes longitudinal wood stringer stiffeners with the WIRE PLANK staples in place. I am convinced that stapling is the best way to go. The four WIRE PLANK layer skin is really rugged with 1.88 lbs/sq.ft. steel content. The stringers are well-attached to the outer shell with heavy 16 ga. x 1 1/2 inch galvanized staples and a glass skin over the entire inside of the boat. A word of caution on sta-

pling. There is a problem with over-driving which results in a reverse knuckle in the wires. It is better to under-drive them and then go over the hull with a hammer and punch and set the staples that stick up.

On my next try, I will use the same basic approach except that I would try a simpler backbone utilizing scabbed plywood instead of all steel. I would build upside down with a first layer of insect screen over the wood. This would catch the FER-A-LITE and eliminate the requirement of a person working inside. I would also change the WIRE PLANK orientation to eliminate the diagonal layers. Instead of fabricated angle iron floors, I would go to an increased shelf thickness at the keel .... probably utilizing two additional layers of small rods 1/8 inch or 3/16 inch on about two inch spacing.

Enclosed is a letter from Rita and Jim Lewis who are building a 32 foot double-ended sloop in Chicago using my method and materials.

Sincerely, Platt Monfort

Editor's Note: The ALADDIN process removes most of my doubts and criticisms of ferro-cement as enumerated in AYRS AIRS 4.52 and AIRS 5.15: "Ferro-cement Boat Hulls - Fact and Fancy." The polyester resin "cement" should effectively seal the hull and prevent internal corrosion. Hulls in my area of traditional ferro-cement construction are bleeding rust badly after a few years in salt water. Platt is unusual in furnishing complete strength data of his materials and composites in his excellent book and the cost figures above. I am satisfied that his method does produce sufficiently strong hulls, whereas I believe that an all-steel hull is much preferable to one using Portland cement and reinforcing rods.

Several things first attracted my interest in this method two years ago. One was the openness and honesty apparent from a reading of Platt's fine 62 page book on his method. Another was the inclusion of recommended scantlings for a variety of craft plus basic strength engineering data. Thus, it was easy to deduce that one could even construct light displacement multihulls above 30 or so feet of sufficient strength using his materials and techniques. I like the idea of his including a catalog of 17 boat plans specifically designed for this medium. I also very much like his inclusion of plans for a ten foot dinghy built using the ALADDIN system. To first-time boatbuilders, I always recommend that they build a dinghy first in the medium they plan to construct a 50 footer for round the world sailing. Few take this advice, but a friend recently completed a 14 foot sailboat and swore never again to build any boat.

While I cannot completely endorse this method, since I personally have not built a boat in this way, it seems valid to me, and I think it should be considered seriously by any contemplating the construction of their own craft. I look forward to the first multihull built in this way.

KEVLAR 49 ARAMID FIBER

We hope to have a series of articles on applications of this unique new fiber to boatbuilding in future issues. It combines high strength and modulus with light weight and toughness superior to other plastic reinforcing fibers. It may be used with epoxy and polyester resin systems and at the moment its most significant yacht applications would seem to be for: boat hull construction, beams for multihulls, standing rigging to replace cable, and just possibly will permit us to design and build the next major sailboat advance - the stayless mast.

Price lists and fabric are available from:

E. I. de Pont de Nemours and Co., Inc.
Textile Fibers Department
Centre Road Building, Room G0209
Wilmington, DEL 19898

or

5500 Union Pacific Avenue
Los Angeles, CA 90022

Prices obviously vary widely with type and quantity. A few samples are given:

(price per linear yard from 1 to 500 yards 38" width) Style 120 - 1.8 oz/sq. yd. - 4.5 mils thick = $ 7.20. Style 281 - 5.0 oz/sq.yd. - 10.0 mils thick = $ 6.95. Style 328 - 6.8 oz/sq.yd. - 13.0 mils thick = $ 7.90.

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PRACTICAL CRUSING, SINGLE-HANDING, SELF-STEERING

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SAVE THE BIG WIND MACHINES - TRANSATLANTIC RACE - NEW YORK TO ENGLAND.

The Ocean Sailing Society: OSS
P. O. Box 1643
Orlando, FL 32802

"WORLD CRUISE NEWS"
Sail Crew Clearing House: SCCH
P. O. Box 1976
Orlando, FL 32802

Phil R. Beach of Orlando, Florida has organized the two societies listed above. The non-profit OSS has among its objectives the acquiring, preservation and operation of large and historical sailing vessels on the world's oceans. There are less than 150 significant sailing vessels over 100 feet long in the world today. Some are derelicts. The OSS is seeking public support at $10 and $25 per year from individuals to locate and restore these sailing ships plus voluntary labor to do so and crew aboard. A worldwide inventory of sail will be conducted, and it is hoped to acquire several of these for the OSS' sail training program and to be on the scene of important nautical events worldwide. The first project of the OSS is the salvage and restoration to operating condition of the 185 foot, three-masted schooner ATLANTIC. The picture below shows her resting on the bottom at Norfolk, Virginia.

Schooner ATLANTIC
See story above.

The SCCH was created to bring together yacht owners needing crew members for long-distance cruises, maintenance, etc. and those seeking to voyage by sail. A b - monthly newsletter is published listing such opportunities: "WORLD CRUISE NEWS," and membership is $10 in the USA and $15 foreign. AYRS Members needing crewmen or women may place a gratis ad. Crewmembers come from every state in the U.S. and 20 foreign countries. As part of the Bicentennial, the SCCH plans to participate in OPSAIL '76 and is arranging an unlimited Transatlantic Race on April 1, 1976 from New York to Europe. Competing boats will participate in the English Sail Training Races from May 2 to July 4, 1976; Operation Sail 1976; and in the Tall Ships Parade.

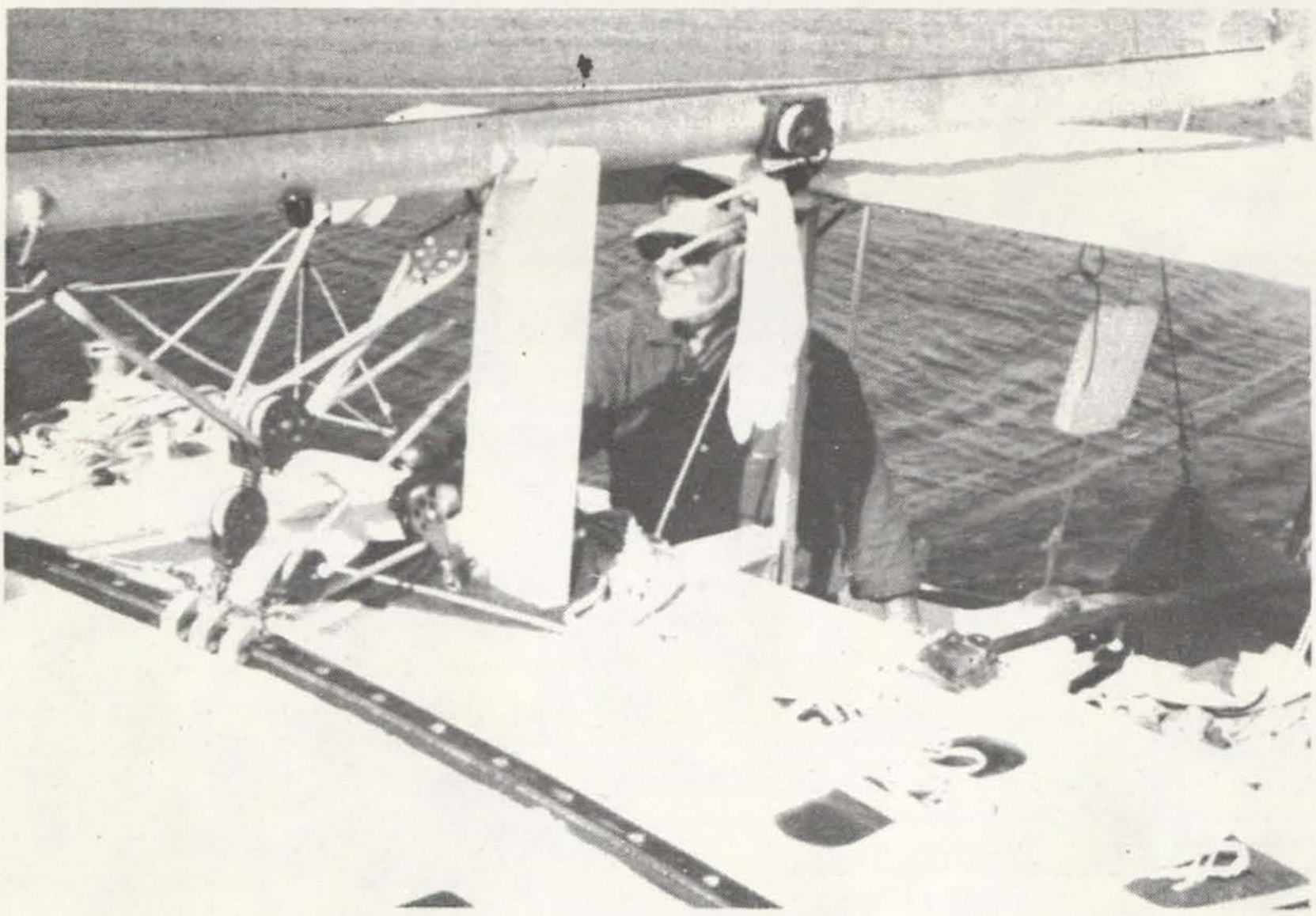
SAILING-CRUISING EVALUATION OF A 32 FOOT TRIMARAN: CATA
By John W. Shortall III

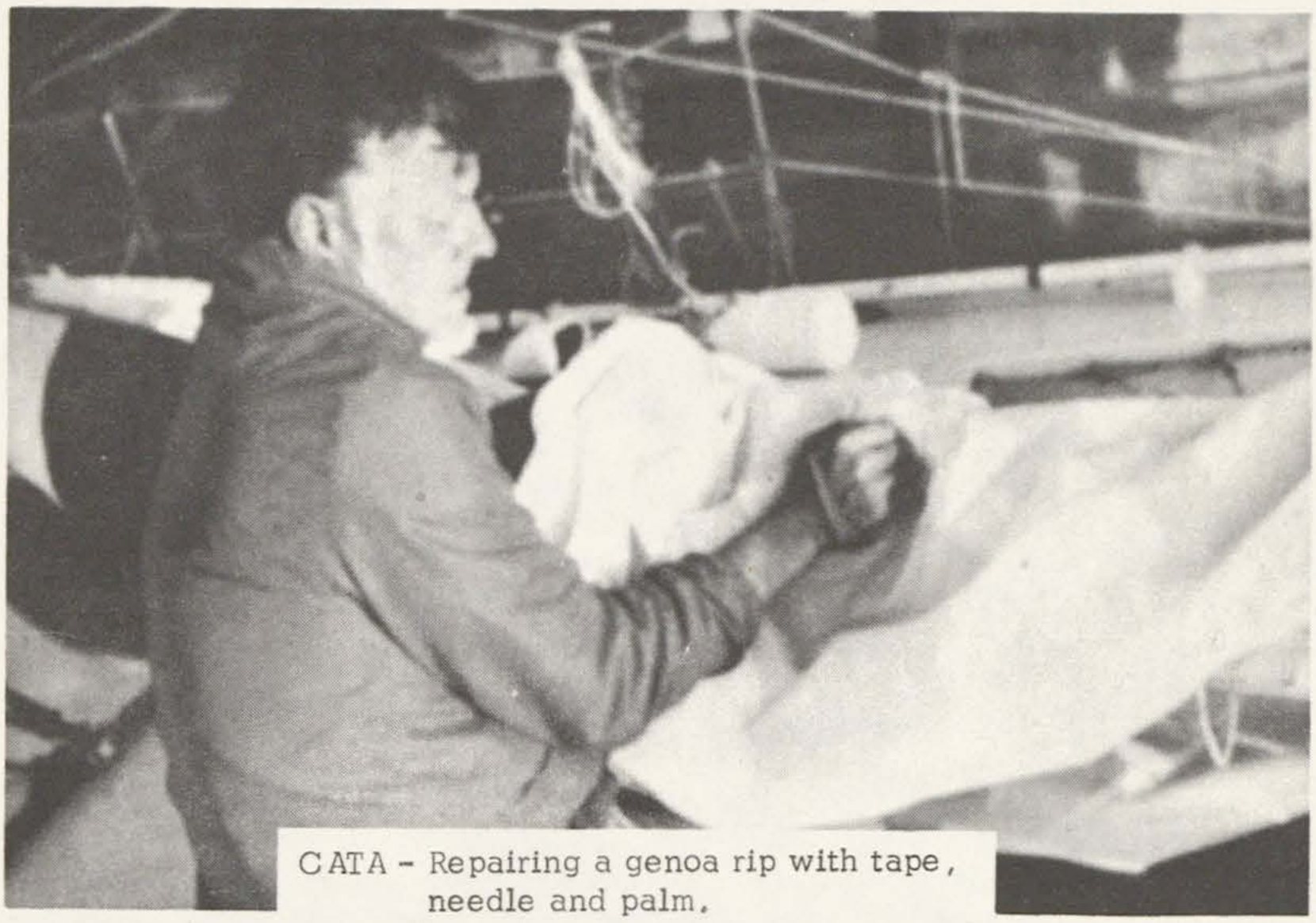
BACKGROUND AND DESCRIPTION.

Most readers will be familiar with CATA, my 32 foot trimaran built in my backyard from 1971 to 1974 of double diagonal marine mahogany plywood (cold-molded) and Alaskan Yellow Cedar, sheathed in fiberglass. Since I design only single hull boats, plans were purchased from Norman Cross, and a number of items were re-

designed. Major changes included a 4% stretch to a LWL of 27 ft. 7 in. and LOA of 31 ft. 10 1/2 in. on the main hull, chiefly forward of midships. Other modifications included: change to cutter rig and addition of running backstays for heavy weather use; complete re-design of the rudder according to some of the results of Edmond Bruce's work and the addition of a heavy, aerofoil-shaped skeg forward of the rudder; restyling to improve her appearance; design and construction of a retractable 9.9 hp Chrysler electric start outboard in a well with automatically closing hull door; wheel steering; furling main and genoa sails; all control lines lead to cockpit for single-handing; twin backstays and drop door leading through the transom with steps inside for dinghy boarding, diving, swimming and recovery of a man overboard. There were a host of minor changes and additions including: rubrails, double lifelines, vents on bows and sterns of all hulls, emergency tiller, open aft cockpit, chart table, L-shaped galley, private head with foam-insulated sandwich plug-in doors, and many others. (See photos: below, page 29, and front cover.)

CATA - Traveler - Mainsheet Arrangement





CATA - Repairing a genoa rip with tape, needle and palm.

Sunday Afternoon - Near Miami.
Looking Aft from CATA's Bridge.

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PERFORMANCE EVALUATION - CATA.

Since I am never loath to criticize other yachts and designs and have never been completely satisfied with any boat I've owned, it perhaps is appropriate to turn a skeptical eye on CATA. For a year and a half since launching, we essentially day-sailed her in a variety of winds, waves and currents in the Gulf of Mexico. Last April, I had her removed from the water by crane and spent three weeks making some improvements and changes as well as changing from SAV-COTE to POLYCOP (better grade of KL 990) bottom paint. The latter, incidentally, appears to work much better in these foul Florida waters than did the former.

The recent 800 mile round trip to the first AYRS FCCG Sailing Meeting in Miami provided an opportunity to evaluate her fairly in a wide variety of conditions. We did not encounter any storms. Wind strength varied from Force 1 to 6 or 1-2 knots up to 27 knots. Reefing was never necessary. Joe Norwood, who accompanied me to Miami, was kind enough to provide his written comments which appear separately.

After the April improvements, and continuous use of the optional jib staysail on the cutter rig, I found that CATA tacked a bit better, though not as crisply as a single hull boat, and her average best heading close-hauled without pinching is 105 degrees between tacks or 50 or so degrees to the true wind. This is not very good. In light airs, she will head up only 55 or more degrees to the true wind. Worse. Re-cutting the genoa, or moving the genoa lead block should help somewhat, but I am no great admirer of turning blocks for large headsails. Clearly, the main and genoa furling exact a penalty here.

CATA is a cruising boat, and speed was never a consideration in her re-design and building. My attempts to install and use the Bruce instrumentation, inherited through the kindness of Harry Morss, were not successful so my quantitative data on CATA's performance are estimates by others and myself plus some fragmentary data from hand-held instruments.

At approximately 12 or so knots of wind, on a beam reach, CATA exceeds her hull speed of approximately 7 knots, and in 15 or so knots of wind, she flies one hull. Below 12 knots, there is considerable stern squat, and it obviously is an effort for her to overcome the hull resistance hump and leave that stern wave behind. Her LWL/BWL for the main hull is only 6.7, so perhaps this should be expected. At 20 knots of wind, CATA really flies at perhaps 12 knots boat speed, and the experience is really exhilarating. I have learned in a very practical way that her performance is very sensitive to bottom smoothness.

It perhaps will be necessary for me to consider reefing when the wind reaches about 30 knots - Force 7.

Float hull separation is insufficient as there is wave conflict in the "tunnels" which must add to hull resistance.

I am now of the opinion that for fast, high efficiency sailing for a cruising couple, a trimaran should be about 40 feet in length with a displacement of about 9000 pounds as the Crowther KRAKEN Bob Conover is building in foam sandwich near Ft. Myers, Florida or the KANTOLA 42 which AYRS Member Ralph Gordon sailed here from Los Angeles. Dick Newick's designs may well have both beaten on performance, however.

TRIP DETAILS.

On this "voyage" we sailed CATA offshore in the Gulf of Mexico for several days, in the Intracoastal Waterway, and on lakes, rivers and canals. Due to our haste on the return trip, my friend Neal Henderson helped me motor-sail her back via the Okeechobee Waterway with engine flat out and all sails up most of the way.

Despite traversing 61 low bridges, many of which opened only on the half or quarter hour, and four locks, the return trip, covering some 400 miles, took up only 60 hours of daylight sailing for an average of 6.7 mph in five and one-half days. By contrast, the trip down via the Gulf of Mexico, Florida Bay and the Intracoastal Waterway with Joe Norwood and his daughter Jenny, took 95 1/2 hours of sailing

time for about 400 miles for an average of 4.2 mph in seven days including 21 hours aground. However, we used the engine only 13.7 hours going down, or 14% of the time and were becalmed one night offshore. On the trip back, we operated the engine for 53 hours or 88% of the time. Ugh!

GOING AGROUND - KEEL VS. CENTERBOARDS.

As with many things, I must perhaps reverse myself from my previous opposition to centerboards. Being now the veteran of 21 hours aground in the channel in Cowpens Cut where I hooked the aft edge of the keel in a furrow left by a dredge, I can quite well understand the arguments for boards. With six inch tides, it took a good deal of kedging, rocking, etc. to get her off. I was so furious about the whole thing - and exhausted - that I promptly ran her aground again - my fault this time. She came off easily with one more kedging exercise. I found later that the ICW has not been dredged in Florida Bay since 1937. Never again!

This points out a fault of a multihull. If in a singlehull boat, I could have heeled her with sails flat or by loading weights at the end of the boom and gotten right off.

For my Florida friends, I will further recommend against sailing in Florida Bay because of the poor correspondence between buoys and daymarks and their charted positions or even existence, and the multitude of fish traps laid right in the narrow channels for miles, even directly in front of the U.S. Coast Guard Station at Marathon.

GEAR FAILURES.

The first item to fail was the wheel steering just off Cape Romano and the Romano Shoals. Little did I realize how prophetic my words were when I wrote on page 11 of FCCG 3 that all yachts should carry emergency steering gear. Although I had greased and inspected the Teleflex mechanism before departure, an out of sight bracket supporting the cable and feeding it to the rudder post tiller arm, corroded and failed at an embarrassing place. It could have been worse. I removed the emergency tiller and mounts from a float hull, and we were underway a half hour later and used such throughout the trip. Joe Norwood is of the opinion that CATA was much easier to handle than with wheel when running across Florida Bay, where we had 4 1/2 foot quartering seas and Force 5 winds gusting to Force 6 or so, under genoa and main.

Dead batteries were a problem at one point, but the engine starts easily by hand and has a 10 amp. alternator for battery charging. On the trip, it was easy to jumper the small, separate lighting storage battery to charge it underway.

An over-enthusiastic lock operator bounced us all over his lock and slightly damaged one float bow which was easy to seal with epoxy later. Permanent repair here will take no more than a half-hour.

The line to the drum of the furling genoa parted suddenly and almost hit us in the face. We were driving under full engine and main only in Force 5 winds with genoa furled. The genoa promptly unfurled, and we were on a spinnaker reach well over hull speed. The three-strand twisted nylon halyard spliced to wire tangled up as quarter-inch line often does, and lowering was a problem. When I did let go, I had forgotten my spinnaker drill of former racing years and did not pull in on the weather sheet as I lowered. The genoa went right into the water off the port bow, tearing an 18 by 14 inch three-cornered rip on the partly-repaired float bow. I am not especially proud of this, but I did learn how to stop a sailboat suddenly in the water from perhaps ten knots or so to zero! A parachute could not have done it better.

Next morning, I taped and hand-sewed the rip, and the genoa set well for the rest of the trip. I will change the halyard line to braided spliced to wire for minimum tangling. I will also secure the furling line to the halyard drum in a better way and add a safety link. See THE MARINER'S CATALOG V.III, 1975, p.79 for the easy way to splice braided line to wire - better than my usual snaggle-toothed results. This is based on a method first devised by Gerry Cunningham of Blockets, Inc., and published in his "Rigging Handbook." Everyone should carry sail tape, a couple of

yards of dacron sailcloth and a sailor's sewing kit with palm, nylon and polyester thread and sail needles.

Upon our return, I found a pinhole leak in the metal portable gas tank which scared the daylights out of me in retrospect. I've thrown it out and will use a plastic version.

THE FAULTS OF CATA.

CATA has all the faults of any trimaran, chiefly due to her beam of 17 ft. 4 in. This makes for problems, especially with dockmasters at marinas, although we only spent a few nights at such on this trip. Refusal of berth space at two marinas in Miami caused me to anchor out one night there just off the Miami City Hall. If I had not carried a gun aboard, this story might have been written by another. The beam also caused a few potential heart failures when running the Intracoastal Waterway off Miami and Ft. Lauderdale on a Sunday afternoon.

The narrow fore-decks are just not good, and I believe all trimarans should have at least the main hull flare out widely well above the waterline at the bow to provide a safe and spacious working platform for changing headsails, anchoring, sounding, etc. I want an anchor windlass as the SL 555 but have no room for same. I see now the reason for pulpits on the float bows, but a 32 foot trimaran is too small to carry them gracefully.

Multihulls are of necessity light displacement, and in some wind and sea conditions the motion is not so good. My subjective feeling is that CATA's thwartships motion is easy and pleasant, while she is too jerky fore and aft in the pitching mode. Neal Henderson disagrees and holds the opposite view.

As Joe points out, trimarans are always sailing, so docking and undocking are often agonizing problems, especially with minimum power. Fortunately, they are light, so they may easily be manhandled if sufficient crew are present.

I cannot avoid touching on a tender subject and that is pride of ownership. I loved our Uffa Fox-designed Flying Fifteen FEI YIN, and our Swedish-built 28 foot King's Cruiser: CLAIRE DE LUNE - both keel boats - and enjoyed seeing people's eyes light up when they saw them. Even now, we keep pictures of these on our coffee table. I have mixed feelings about CATA. To me, she is a beautiful yacht, and I think I have managed to improve a bit on Norman Cross' excellent design esthetics - his strong point as a designer in my opinion. However, I find that many yachtsmen's eyes tend to glaze over when they learn our 32 ft. auxiliary yacht is a trimaran. Immediately, I am associated in their minds with a group of undesirables who own multihulls. To compound the problem, I also sport a beard. I found this attitude particularly true in Miami - a real jungle. Strange that we in the U.S. who pride ourselves on "progress", whatever that means, are more conservative and backward then our British cousins.

Another fault of CATA is that due to her hull lines as designed, plus a little extra weight in building, she trims down by the stern a bit and drags her transom through the water. This fusses the water up and slows her down materially. It is quite noticeable that when several people move forward or aft of midships, she easily trims down by the stern but not by the bow. This means that her prismatic coefficient (See FCCG 3) aft of midships should be higher; in other words, she should be fuller aft then is shown in the original design. One remedy would be to add perhaps another three feet on the main hull aft and fatten up the sections there for more buoyancy to restore proper trim and get that transom out of the water.

For high efficiency sailing, the low aspect ratio keel which helped so much in the quartering seas in Florida Bay, should be cut back to a fin with an aspect ratio of one or so as Edmond Bruce recommends. Hydrofoil leeboards should then be installed on the float hulls for maximum lift with minimum wetted surface and to ease the problem of getting her off shoals. Wheels on the bottoms of the leeboards would really make her a "single hull boat with training wheels" as Ed Mahinske jests about all trimarans.

The Chrysler 9.9 hp electric start outboard with sailing propeller, fully retracting with remote controls to the helm works very well in forward gear and has turned out to be most reliable. It is coughing now at bridges, so I suppose it needs an overhaul after perhaps 120 hours or so of hard use. It consumes about 1.4 gallons of gas-oil mix per hour, the engine is very noisy, and reverse gear is almost worthless. If there were sufficient buoyancy and length aft, it might be possible to install a small diesel inboard, at the cost of at least $2,000, but I doubt that I will do this. I have long been opposed to elaborate engine installations on sailboats, but as a veteran of 61 opening bridges in 5 1/2 days, I am not so sure I am right.

CATA is somewhat overweight, but I knew that when I built her. She is not designed or built for racing. Her Bruce Number with all gear aboard for extended cruising for three is only about 1.3, but then I see many newly-designed or manufactured single hull boats with Br less than one! I am sewing up a 2.2 ounce dacron drifter-light air genoa which will boost this to 1.4 and for running when I can spread both genoas to 1.5.

Another basic fault of any trimaran is the lack of load carrying ability without destroying the unusual and exhilarating sailing qualities which make a multihull unique.

At one point in the trip, we tore off the speedometer propeller when exceeding hull speed. We burnt out the compass light, and I could not locate the spare. It is a special Japanese bulb, so I had to use a temporarily wired light taped to the frame for the rest of the trip, and it was only moderately satisfactory. I could have installed my spare, lighted compass usually mounted over the chart table, but I already had an accurate deviation table for the loaded condition on the main steering compass and wanted to continue with that.

There was trouble with the electrics for the entire trip - connections corroded by the salt air. I removed most of the deck plugs - "waterproof" - and connected everything directly to the fuse panel. Kerosene cabin and anchor lights were only moderately satisfactory. Trimming the wick of the oil lamp is the answer to that one, but I have never managed to get my two Optimus quicklight pressurized kerosene (paraffin) lantern to work properly.

The final problem was that after seven days of sailing to Miami, the AYRS burgee tore in shreds. I sent it to Michael Ellison in England to put under his Christmas tree with the wish that more durable material be used in the future. I had a spare aboard. By contrast, that magnificent AYRS windsock in all its yellow glory, did very well. I had never used a windsock before CATA but find it far better and more visible day and night (with masthead light on) than any other indicator I have used. Both Michael and I sell them to Members for $4.00 for the 16 inch cruiser size or $2.00 for the 5 1/4 inch dinghy size. The AYRS blue and white burgees go for $3.50.

WHAT WENT RIGHT WITH CATA.

All boats are compromises, and despite my negative statements previously - you should hear what I say about most of the plastic production boats - we really like CATA very much and find her most comfortable, and easy and fun to sail and relax in. Isn't that what it is all about?

CATA is light on the tiller or wheel, and her balance is excellent on most points of sailing and wind strengths. Her steering control is also good with no particular tendency to broach in high winds and following seas when running. The furling main and genoa controls are a joy, and I sail a good bit more than otherwise because the genoa and main can be furled or unfurled within 20 seconds without leaving the cockpit. The ten foot Nicro Fico husky traveller with large bronze bearing car across the cabin top makes possible many fine sail adjustments for better pointing and faster sailing. The jib staysail on the cutter plan I designed is great. Only 70 sq. ft. with reefing cringles and ties, this sail adds much more to the speed and efficiency of CATA than its area implies.

The accommodations were designed for three, and they worked very well with one

exception. I have a swinging, removeable chair of my own design in front of the chart table. However, entering or leaving the galley is difficult or impossible when I am seated in that chair. I take and work out sights in the morning, at noon and in the evening, just at meal hours. This conflict never occurred to me.

Level sailing in all conditions is very enjoyable and a major advantage of most multihulls. This makes possible the use of the 42 inch wide berths over the wing decks, and sleeping is very comfortable. The forward, extra-wide and long vee berth was not very comfortable underway due to wave slap. However, the settee is available for temporary use. The galley works well but was designed and built for my five foot tall wife. Being one foot taller, I do not fit well therein.

The cooker is a Ronson marine stove with plug-in butane cylinders. It works extremely well with a very hot, low flame and no danger of flaring. Having once been aboard a boat which started to catch fire from a flaring cooker, I am afraid of kerosene and alcohol.

The 3.7 cu.ft. ice box worked extremely well. Ten pounds of dry ice or 30 lbs. of wet ice lasted four days with good cooling.

The head dressing room is good but I would not again purchase the Monogram Handihead Marine Toilet. I installed that with its small integral holding tank to comply with the multitude of idiot regulations and laws enacted here on pleasure boats. It is expensive, difficult to install and does not work properly. It is not very robust and looks like a cheap piece of plastic. John Norwood's bucket is the only answer.

Water storage in plastic jerry-jugs worked very well, but the Wilcox-Crittenden galley lever pump gave constant trouble. I am not as much a fan of W-C equipment as I once was before a conglomerate took them over.

Anchoring was easy, and we rode well in many conditions using a bridle (constrictor knot) connected to both float bows. I have a 14 lb. Northill as a lunch-hook/kedge and a 35 lb. Danforth for peace-of-mind anchoring and heavy kedging. I'd rather have a plough anchor as I've used in the past, but had no trouble with these holding. I left the twin of that Danforth in Cowpens Cut as a donation to the happy citizens of Key Largo, not one of whom would help me recover same at the end of an exhausting day as they roared by in their put-putters.

EQUIPMENT AND SPARES.

Due to my night encounter anchored off Dinner Key Marina with an intruder and later stories told me by the dockmaster and yacht owners there, I was most happy that I had brought my WW II vintage hand weapon. It seems to make a surreptitious dinghy occupant row very quickly at night after he has just tried to board your boat in hopes you were asleep. If I ever return to that area - doubtful - I'd want a cannon. As violence grows in our country, perhaps we should encourage the development of a stainless steel shotgun. West Products? Chris Craft?

My Avon Redcrest dinghy worked very well, is easy to row in almost all conditions, and I was glad I had it. Normally, I carry it deflated in one float hull, but for the offshore portion of this trip, I lashed it partially inflated to one of the forward nets between bows.

Bruce DeClos loaned me his Hand Bearing Mini Offshore Compass. It was a joy to use, and at two points in the trip was vital. It is so rugged that it can and has been thrown from Bruce's cabin to his cockpit sole, and it just bounces unharmed. It is sold in this country for $55 by West Products; 161 Prescott St.; East Boston, MASS 02128 - Cat. No. 30-270. It has a beta light for night use, seems quite accurate to me and is very useful when swinging the main compass.

I did not have an RDF on this trip and wish I had been able to afford same. It would have helped very much on two occasions. I did not mind the lack of a depth sounder, and I found my sounding pole and home-made lead line sufficient.

With only three people, time just did not permit working out more than a few of

the sights I took. The few I plotted did not give accurate fixes - an indication of my lack of recent practise. The Davis Co. portable speedometer worked very well until we tore the end off at high speed. In calibrating this, I found it accurate to five percent at five knots speed. The three year saga of the Omni Company never shipping me the expensive binnacle mount compass I ordered and paid for has had a further development. Just two weeks ago, I received the binnacle head, but still no compass. The expensive knotmeter from this company has never worked due to a burnt-out or defective transistor in the sealed sensor which cannot be repaired.

One rubrail on CATA is marked in one foot increments, and speed determination is quite accurate from timing a chip thrown in the water just ahead of one bow.

Spares were carried for most everything reasonable except for the extra compass light I could not find. Most were unnecessary, but the few I used were needed very badly.

Thanks to my friends Neal and Bruce, I was well-equipped with all the charts needed for the trip. The recent doubling and tripling of chart prices in this country coupled with the annual issue of new editions of many, makes cruising a very expensive proposition. In addition to small-scale planning charts, plotting sheets and pilot charts, I carried and used 30 charts on this trip - all that are issued for these areas in the U. S. - over $100 in total cost. The net result will be that many, like myself, will sail with outdated charts. Others just will not carry many and some none at all. Our bureaucrats are in effect making cruising more dangerous and negating much fine work by the U.S. Power Squadron and U.S. Coast Guard Auxiliary. If surveys and chart production were turned over to a private contractor, prices would undoubtedly be considerably less, and astonishingly, charts might bear some resemblance to reality.

While I am not in favor of carrying a radio transmitter, I do have a good multiband receiver. As seems to be customary, weather forecasts and reports in south Florida bore little relation to the actual conditions. I never did hear the supposed VHF-FM weather station at Fort Myers.

TRIP PREPARATIONS.

It took me three weeks of essentially full-time work to prepare for this trip. Some are not as careful as I, but I note many frantic calls to the Coast Guard for help which in most cases could have been averted by proper education, experience and preparation. Personally, I would be ashamed to call the Coast Guard unless there were a medical emergency aboard. If I get in trouble on a pleasure boat at sea, it is my fault, and it is up to me to get myself and crew back safely. One advantage of building your own boat is that almost anything aboard may be repaired or jury-rigged in confidence.

Many of my preparations took the form of trip planning, selection and tabulation of various routes, study of six months of Notice to Mariners, and the like. I precalculated: courses, distances, times of sunrise and sunset (nautical and civil twilights) altitudes and azimuths of a few major stars and planets, and sight reductions for typical cases. It is so easy to goof on a small tossing boat at sea. HO 229 was no bargain at $11.50, so I used my old HO 214 and even older HO 211 as a backup. I always have the Nautical Almanac and found for piloting that the tide and current volumes for 1975 were most helpful.

I'd like to give a plug here for the free U.S. Power Squadron courses. I had taken all the regular course through "N" or advanced celestial navigation to refresh my rusty WW II knowledge and found them extremely useful on a trip of this kind. Even the "JN" and Seamanship courses which I despised at the time were very useful occasionally. I admire this organization greatly and only wish that all yachtpersons would take time to attend their night school courses which are given throughout the U.S. by experienced Volunteers.

The last check list for CATA contained some 66 items for trip preparation and main-

tenance, not all of which were done. We had no ugly surprises on this trip.

WORK.

The purpose of this article is not to discuss the joys of sailing or the pleasures of cruising. We all know about these, and if we do not, all one has to do is pick up one of the glossy boating magazines. The articles on such are all about the same. I've learned to love night sailing offshore - in good weather - but let the word artists talk about this, I'd rather experience it. What I am trying to do in this piece is to discuss those things which I felt or had happen which are usually ignored in the ocean sailing books or articles.

Cruising is hard work. At least one aboard must be in excellent physical condition and should be strong. There is always work to do on a cruising sailboat and never enough time to do it all. Lines must be coiled, whippings renewed, dishes washed frequently, compass deviation checked, bearings plotted, DR position established frequently, boat aired, etc. etc. I make it a practise at sea to go over everything on deck with my eyes at least three times a day on a leisurely stroll - yes, you can stroll around the decks of a 32 foot trimaran - usually in perfect safety and comfort - a major advantage. I always find something that needs doing such as an unwired shackle on a running backstay. Eliminating chafe is a never-ending task, even on a short run as this. Gasoline refueling from spare tanks underway is an anxious chore, and replacing water jugs under the faucets is no fun. Neither is cleaning out the holding tank for the marine toilet every three days or so. Cleanliness of ship is of vital importance but thank goodness shaving is not.

CONCLUSIONS.

I don't have any pat answers to some of the controversies and problems I have suggested here. No small boat under 100 feet is ideal, and I am just as critical of the yachts of others as I am of my own. For our particular situation - my wife has rheumatoid arthritis - a trimaran is as close to ideal as is possible. Thirty-two feet seems to be the largest I feel comfortable single-handing or for short-handed sailing. Others of more experience may well disagree and be correct too, especially if they have self-steering which I as yet do not. I do not particularly like the heel of single hull craft any more and find that I tire less quickly on CATA due to its level sailing quality. It is hard to get used to the light displacement motion when you have owned only keel boats, but I suppose that will come in time. While I did not expect CATA to be particularly fast, she does better than I thought she would - another justification of the Bruce Number application. CATA is a very comfortable cruising yacht for two or three people and seems to be even better and more pleasant at sea than she is at the marina or at anchor.

John W. Shortall III

Letter from: Bruce Du Clos; Yacht SWAN; P.O. Box 8433; Madeira Beach, FL 33708.
Dear Jack,

I have read your article about the 800 mile cruise to Miami and back with some interest. I must quibble with your statement that cruising is work. I find cruising to be very physically demanding but very satisfying and relaxing. I would not call it hard work. It is the most relaxing endeavor I know or have ever been involved in.

Sincerely, Bruce

Editor's Note: Bruce speaks from a background of 37 years of sailing. See FCCG 3, Page 9.

Letter from: Dr. Joseph Norwood; 1021 Valencia Ave.; Coral Gables, Florida 33134.
Dear Jack,

I am glad the meeting is over because I had a lot of other things backed up. On balance, I think we did OK. The quantity and quality of the attendees was excellent, and I am satisfied that everyone was stimulated and had a good time.

The following are my comments on CATA:

1. Lateral plane and rudder first class in all but quartering sea conditions. I suggest that the addition of leeboards athwartship the present CLR (Center of Lateral Resistance) and the removal of six inches or so from the bottom of your keel and skeg/rudder would make a good combination for all conditions. The leeboards should toe in 2 or 3 degrees.

2. Poor pointing - mostly the fault of baggy genoa foot. Recut genoa to fair miter line into sheet at present lead block location.

3. Underpowered - Increase sail area to about 720 sq. ft. by going to a loftier rig. By all means stick to furling main and genoa. They are great. I think 720 sq. ft. pyramid rig could also be great on your boat, but we shall have to wait and see how Mike Culjak's catamaran works to be sure.

4. Fatten and flatten lines of main hull aft with Airex blister to prevent stern squat. This will also promote much better speed and performance in following seas.

5. Find some way to keep the tiller out of the cockpit as for example by moving the tiller axis, or by going to a destroyer wheel with reduced gearing.

6. The table in the cockpit is great but find some way to fold it.

7. Everything else about CATA is wonderful. You have really done yourself proud.

Sincerely, Joe

Dear Joe,

I suppose CATA's running in quartering seas could be improved, although I thought I understood you at Marathon to say that she did well in those conditions in Florida Bay. I would not want to reduce the aspect ratio of her keel any more - it is already too low - nor would I want to reduce the rudder area, depth or aspect ratio. I think the answer may be a fin keel with aspect ratio of one plus the hydrofoil leeboards, but I doubt that I will find the time, money and energy to do all this.

Her 50 to 55 degrees to the true wind without pinching is also caused by: genoa and main furling and consequent sagging luffs despite wire halyards, winches and an extra purchase on the genoa luff; windage; flexible, light displacement hull preventing good luff tensioning. We tried to reset the genoa to turning blocks on the quarters on the return trip. The foot tightened up well, but that is when the furling line parted and the excitement began.

Since you feel that the float separation is inadequate, and I agree, it is difficult for me to understand the recommendation for a 38 percent increase in sail area and a loftier rig. I would want to work out the stability change rather carefully before doing this. Speed is fine, but capsizes can ruin whole days. The estimated $3000 cost for this change puts me off more than a bit.

Someone is going to have to prove in practise to me that the Pyramid Rig is really an improvement before I invest the rather large amount of money necessary to make a radical rig change. I still have my doubts, and if I wanted to try something new, I would prefer to go to John Morwood's SES: Semi-Elliptical Sail. Despite almost two years of work, Mike Culjak has only just barely finished his two hulls. It will be a long time before we have a good sailing evaluation of the Pyramid rig, unless you finish up THUNDERBOLT soon.

Sincerely, Jack Shortall

Letter from: Neal Henderson; 9500 Hamlin Blvd.; Apt. 1203; Seminole, FL 33542.

Dear Jack,

I am happy to comment on CATA and criticize her per your request after our very fast trip from Miami to St. Petersburg, Florida.

There is a definite resistance hump that is felt. I think that is the biggest difference between a monohull and a trimaran - you see the stern wave drop behind when

that hump is overcome.

I prefer the tiller to your small spoked wheel, but would recommend a change to a larger wheel with no spokes. My complaint about roller furling is that we rolled the genoa in with wind a steady 15 knots gusting to 25 and the engine on full. It rolled in too tight and left us with about 5 sq. ft. of sail flogging. When sheeting in tightly, that 5 sq. ft. had enough pressure to spring the line free of the drum, letting the sail fill. The only solution was to drop it. The other problem was that the halyard line was too small and became fouled too easily. It took an extra two or three minutes to unfoul it. The lee float had sharp edges on it from being epoxied after hitting the lock - caught the sail, ripped it and sucked it under the lee float hull. That is an example of Murphy's Law - how little things all come together to cause a big problem.

A trimaran has horizontal room not vertical. I like the cooker and the sink. The ice box is very inconvenient down on the sole. The chart table was very handy. The head was too cramped. I had to put clothes on in the main cabin. I think you sacrifice some of the inside space for very pleasing exterior lines which I would rather have. The cockpit table doubling as a helmsman's seat worked out very well.

I find your compass very difficult to read. Numbers are too small. It is nice to have a compass where the numbers are magnified when looking straight on. I think the cutter rig is the only way to go. It is really excellent, with the self-tending staysail. It seemed to suit the boat very well and balanced out with it.

My own personal view on the rigging is the simpler the better - the least amount of blocks the better. CATA is experimental so has many blocks. But, for cruising, she should be simpler. I can see a use for main and genoa furling. Coming up to bridges and locks, we could douse sails very quickly. It wouldn't be my personal choice because it is too complicated and leads to poor sail shape with the main because it must be loose-footed and can have no battens. I would not discourage people from having it because I can see in some situations where it would be a necessary compromise.

One thing cruising boats often lack is a good rubrail which CATA does have. Boats need some sacrificial piece of wood to protect the hull. Your docking cleats are too small but nine is the correct number for a trimaran.

People should never travel the waterway at night in unfamiliar areas, no matter how experienced, and in familiar areas only with a portable high intensity spotlight as we used on the last night crossing Tampa Bay and entering the blacked-out channel to your marina.

I enjoyed your trimaran CATA and our sail across Lake Okeechobee - very exhilarating. To put it in a few words - she got us home and did a good job making excellent time.

Sincerely, Neal Henderson

Editor's Note: Neal is a monohull sailor of considerable experience. See FCCG 3, 11 for background. He and his wife Diane had a bad experience taking a 50 foot trimaran to Bermuda for the owner, so I much doubt he will ever own a "sailboat with training wheels."

COMMENTS ON CHANGEO - 43 FT. SAILING FREIGHTER FOR A CRUISING COUPLE

Editor's Note: FCCG 2 described CHANGEO as a new concept or rather a revived concept, with the hope that the day of the sailing cargo ship would soon return CHANGEO will be featured in the February issue of "CRUISING WORLD."

Letter from: Ephraim C.S. Clark; P.O. Box 152; Horseshoe Beach, FL 32648.

Dear Jack,

In commenting on your sailing freighter, I cannot see good enough to make out the plan on the back cover. It would seem that if the vessel should ground with a full cargo, there would be a lot of weight on the forward end of the keel. This ends up

in the middle of the after hold where it is hard to reinforce the hull to take this strain. I would suggest extending the keel to the next bulkhead.

I don't see any handy means of hoisting those barrels and boxes out of the holds and swinging them ashore.

It would seem that the centerboard trunk through the bulkhead would weaken it so that if the cargo should settle and spread throughout the hull, it could cause leaks in the centerboard trunk.

I don't see any means for moving the shifting ballast from one compartment to another without bringing it on deck. This would have to be done every time unless the return cargo was the same weight. Suggest small waterproof doors in the bulkheads to pass the ballast through.

As much as I would like to attend the first sailing meeting, I cannot. It is quite a long ways to go with my 13 ft. sailboat (Ed.; 500 miles), and my only land vehicle is my bicycle which I ride to Cross City some 29 miles away, but there is no bus station there.

Sincerely, Ephraim

Letter from: Ken Good; P.O. Box N8518; Nassau, Bahamas.

Dear Jack,

In one of the Newsletters (FCCG 2) you asked for comments on a sailing freighter for a cruising couple called CHANGEO II. My comments, which follow, are probably the most uninformed you will get and are, no doubt, open to be severely "shot down." They come from a feeling in the seat of my pants.

The widest part of the boat is abaft the forward end of the bridge deck, and since it is shoal draft, this must be the centre of buoyancy. With five tons of freight, all forward of this, you may have to go well aft with your 9000 pounds of lead ballast in order to keep the nose up. In deep wave formation, will this cause pitching? If it does cause pitching, will you get heavy water on the fore-deck which will run aft and smash into the superstructure including the door into the living accomodations? The level of the cargo in the forward hold appears to be above the shown waterline. If this is so, will this tend to cause rolling on so narrow a boat?

Should these comments contain merit, the following improvements might be made. Give the boat fuller sections forward, thus giving it more lift there although sacrificing some speed. This would also enable the soles in the holds to be placed lower. The centre of the foredeck could be raised with the two sides of the foredeck sloping down to the sides. (Ed. - highly-cambered deck). This would tend to give water falling on the deck and moving aft, an inclination to move toward the sides. I would also have the superstructure coming to a blunt point forward and have access to the foredeck by steps leading from the bridge or from a door on the side or both.

Having said all this, I would like to see a retired couple helping their pension funds by using such a vessel to run vegetables and fruit to Nassau from Haiti. The difference in prices between the two places must make the profit worthwhile.

Sincerely, Ken Good

Letters from Jack Shortall.

Dear Ephraim,

With a 3 foot draft - board up - CHANGEO should not run aground often. The strain ordinarily will be taken in the aft hold - you are correct - but this is heavily reinforced by the rugged centerboard case, mast step structure, etc., and the load should be transferred to floors, frames, hull and deck as Herreshoff recommends. These details do not show in the drawings in FCCG 2. The centerboard trunk is made of two layers of 3/4 inch marine plywood assembled with 4 x 3 inch fir ledges. The whole case is tied in to four extra-large floors, six longitudinal keelson blocks 2 x 3 inch, 1 1/2 inch aft bulkhead, sole and the mast step which itself traverses three rugged floors. I was trying to keep the wetted surface low and make her easy to tack. However, you may be right that extending the keel forward would be better for

a work boat. Perhaps a sacrificial metal strip would be best.

Handling freight loads is up to the owner-builder and depends very much on the type of cargo to be carried. Some might prefer to fit these holds out for passengers only - up to 12 may be accomodated comfortably, and men and women may be segregated. Two husky headsail running poles can be rigged easily with tackles to hoist and transfer cargo to dockside or bumboat, and the jib boom may also be used alone at a slower rate.

Watertight doors through the two bulkheads are difficult and expensive to build. I emphasized safety and economy here rather than efficiency. Agree that chain plates are best fastened to a bulkhead area, but this was not possible. They are bolted through the planking with 3/4 inch marine plywood backing plates fitted between stringers and frames.

Sincerely, Jack Shortall

Dear Ken,

The longitudinal center of buoyancy of this hull is 53.4% of the LWL aft for minimum hull resistance. With the forward hold loaded to 1.2 tons and the after hold to 3.7 tons (recommended full capacity)(long tons of 2240 lbs. each), the hull will immerse 7 1/2 inches deeper in the water. The calculated righting arm at 30 degrees heel is lessened only from 1.20 to 1.14 feet, so the stability is relatively unaffected. Allowing for the change in center of flotation around which the hull trims fore and aft, a full load of cargo would require all of the extreme forward ballast and about half of the intermediate forward ballast to be moved to the aft location to keep her in trim. About 85 billets of lead would have to be shifted. This should not cause more pitching - the ends are kept light and the weight is well spread out - longitudinally and laterally.

The wheelhouse front is protected by the outside seats and winch platforms plus both cargo hatch coamings and deflectors and the mast. A later version of the construction drawing gives the builder the high strength option of building the bulwarks and cabin sides and fronts in the same way as the hull: multiple diagonal (cold-molded) 1/8" veneers to 3/4 inch thickness with 1/4 inch balsa core sandwiched in the middle to keep the center of gravity low.

Although not shown in these drawings, the deck is highly-cambered, and there are to be large freeing ports in the bulwarks to keep a minimum of solid water off the decks. I am reluctant to raise the bow or topsides further because of windage - the non-reefable sail area in hull and cabin sides which cause so many problems in modern crusing boats.

There is a door from one side of the wheelhouse to the side deck which leads both forward and aft. There are so many times when one must get forward in a hurry that I am reluctant to omit that central companionway adjacent to the wheel. On one boat we owned, I had to throw myself on my stomach on the side deck and skid forward to the bow in emergencies. I learned to hate non-skid paint that way.

Sincerely, Jack Shortall.

Letter from: Prof. Walter Castles Jr.; Box 370; Big Pine Key, FL 33043.

Dear Jack,

Have been trying to rationalize catamaran design as a hobby since I retired. My neighbor and I built two catamarans to my designs which have turned out to be in accordance with my precalculated performances, as close as I can measure it. The cats are of airplane - stressed skin stringer, frame construction stressed for an immersion depth of two feet of water over the top of the cabins, are 32 ft. long, 15 1/2 ft. beam and weigh about 3600 lbs. empty. They are designed to cruise at 6,000 lbs. gross weight at which the draft is 22 inches. Sail area is 640 sq. ft. (Ed.: thus

Bruce No. is 1.39). Maximum speed using the two 40 hp outboards is about 16 knots with a fuel consumption of 1 1/2 gallons per hour. The motors are on retractable mounts which operate from the wheel in the center cockpit and in the up position give about 20 inches clearance over the water. All sails are handled from the wheel. Speed under sail depends on how much nerve one has, and I am too old to want to take chances. However, I usually make about 7 knots in 10-15 knot wind conditions and have averaged about 12 knots in comfort on some legs of cruises as from Nassau to Chub in the Bahamas.

For those who have access to a Hewlett Packard Model 65 programmable computer, I have programmed some of the equations I worked out when I was designing the cats, and they are available from the HP 65 Users Library. The new HP 25 keystroke programmable computer at one-quarter the price might also be suitable.

Sincerely, Walter Castles

Editor's Note: I am trying to persuade Walter to describe his equations and their derivations for future issues of our AYRS journals. Walter uses neither keels nor centerboards to achieve lateral resistance but rather has 1 1/2 inch vortex generators on the bottoms and claims these allow him to split 90 degree tacks. His equations and computer programs are applicable equally to monohulls and catamarans. The enclosed pictures give an idea of his unique furling sail twin rigs.

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AYRS - Florida-Caribbean Contact Group

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FCCG SAILING MEETING NO. 1 - November 29 and 30, 1975 - MIAMI, FLORIDA.

One-quarter of the respondents to our questionnaires indicated that they would like the AYRS FCCG to hold sailing meetings and/or symposia. Therefore, SM-1 was held in Miami on 29 and 30 November last. Due to the last-minute cancellation of the Whitbreak Multihull Race, the site was changed from Key West to Miami.

I want here to thank George Cleland, Bob Conover, Leland Hardy and Raymond Lovett for their enthusiastic participation as well as others - both AYRS and guests - who attended. Joe Norwood hosted us at his home one evening for discussions, displayed his two beautiful proa hulls for THUNDERBOLT and presented a film on the 1973 John Player's speed trials and slides of the 1975 Long Island speed trials kindly loaned by Rod Wright of the Viking Multihull Club in Michigan.

All were able to prowl around CATA, my 32 foot trimaran, investigate her single-handed rig with furling main and genoa and pick her apart. Bob and Leland had a short sail aboard her, and Bob demonstrated his prowess at rowing an Avon inflatable dinghy out to the anchorage.

Bob Conover brought drawings of the beautiful CROWTHER KRAKEN 40 ft. Trimaran he and Pat are building in foam sandwich. George Cleland had a number of remarks and questions on his interest in wing sails stemming from his previous work on experimental aircraft. He, Leland and I tentatively agreed to build entries for a Florida $50 Regatta on the basis of the Texas events held by Joe Gray and Ed Doran. George was seeking ideas for building a simply-constructed hull or hulls to use for an experimental platform to test out his ideas, and Leland had a number of suggestions, which he will write up for us.

SAILING MEETING NO. 2 - AYRS - Florida-Caribbean Contact Group. April 24, 1976: Lake Somerville, Texas. Write: Prof. Edwin Doran, Jr.; 1114 Langford; College Station, TX 77840; Tel: (713) 846-6679.

The fourth Fifty Dollar Regatta will be held on the above date. Please contact Ed Doran for entry blanks and details. Previous regattas were described in AYRS AIRS 7,5 and FCCG 3,7. Due to inflation, designers and builders are permitted to use $65 worth of materials in construction - "estimated fair market value," and these must include the entire boat: hull, rigging, spars, hardware, sails, etc. Boats race around a conventional triangular course, so windward performance is vital. We hope to hold a similar event in Florida to challenge the more-experienced Texas designers, and I am trying to encourage similar regattas in Michigan, Virginia and California. Almost anyone can design a $30,000 sailboat, although even many of these do not sail very well at all, but design and construction to these economic limits tests the ingenuity, ability and intelligence to the ultimate. That is one of the things the AYRS is all about.

SAILING MEETING NO. 3 - AYRS - Florida-Caribbean Contact Group. May 15 and 16, 1976; Fort Myers Beach, Florida: Warren Noden; 331 Palermo Circle; Fort Myers Beach, Florida 33931.

Warren Noden was kind enough to volunteer the use of his large, waterfront home on Florida's southwest coast as the site for SM-3. As many as 20 cruising and racing sailboats have been docked in front of his home, and up to 100 may meet in comfort ashore. This is off-season in Florida, and there are many motels within walking distance. For those preferring to live aboard their yachts, water and electricity are available there.

We encourage participation by both AYRS and prospective AYRS Members and expect a rather large attendance. My 32 foot trimaran will be dwarfed by a Concordia

40 yawl, a 38 foot high performance catamaran, and several high performance trimarans. Members are encouraged to bring models, sailable or trailable boats and any entries for the $50 Regatta we are hoping to hold in Florida.

The AYRS is an informal organization, and we hope to have a good deal of fun as well as idea exchanges. Our plans are to hold discussion meetings on the following topics, and all are welcome to participate. Sessions will be recorded for later publications in the AYRS series. If anyone cares to submit written materials - drawings and/or papers on any of the topics under consideration - these can be included in the later publication. We will try to have projection facilities available if you will let me know your requirements. I will have a number of AYRS publications, books, windsocks, burgees etc. on exhibit to acquaint those new to our 20 year old organization with our interests. There should be ample opportunity to visit a variety of craft, and weather permitting to sail or race aboard some depending on the owners' wishes and time.

Our tentative program is as follows:

1. Saturday Morning - May 15, 1976.
   Long Distance Sailing and Yacht Cruising - Bruce Du Clos & Neal Henderson.
   Short-handed and solo cruising, self-steering, rigging ....
2. Saturday Afternoon - May 15, 1976.
   Advanced Materials and Boatbuilding Applications.
   Kevlar (r), Carbon Fibers, WEST (r) System, Aladdin, Stayless Mast ....
3. Sunday Morning - May 16, 1976.
   Long Distance Cruising for Women - Ms. Penny De Clos.
   Stores, foods, food preparation, refrigeration?, yacht medical chest, narcotics, special female problems, how much work should a woman sailor be expected to do?
4. Sunday Afternoon - May 16, 1976.
   Sailing Yacht Research - Design for High Speed Sailing - Dr. Joseph Norwood.
   Hydrofoil developments, performance prediction and measurement, hull designs and sail rigs including single- and multi-hulls and more advanced concepts.

ST. MAARTEN TRADEWINDS RACE - 10-21 April, 1976.

Peter Spronk sent a race brochure for the above which covers some 800 miles and begins and ends at St. Maarten. No self-steering gear is allowed, both multi- and single-hull boats are encouraged to participate, and the race is sailed in four legs: St. Maarten to Virgin Gorda; Virgin Gorda to St. Croix; St. Croix to Martinique; and Martinique to St. Maarten. The opportunities for partying seem most attractive. For race brochure and entry blank, write: Snt. Maarten Tradewinds Race; P. O. Box 314; Snt. Maarten, Netherlands Antilles. This sounds like a good fun, leisurely race, and with three stopovers enroute plus a party on April 21st, I wish I could be there.

JOINT OWNERSHIP OF LARGE CATAMARAN IN WEST INDIES?

Letter from: Antony Johnson; Box 222; St. John's, Antigua; West Indies.

Dear Jack,

Thank you for your newsletter, and I am most interested in your activities. My personal experience includes the design and construction of several boats - a 30 foot plywood catamaran, a 40 foot foam/fiberglass catamaran, both very successful boats which have now had several years of charter use.

It strikes me that some of your group could be interested in the joint ownership of a large catamaran which could be used for chartering part of the year to cover costs and be available to members for personal sailing at other times.

Sincerely, Antony Johnson

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Repairing Genoa Rip - See CATA, Pg. 27

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